

# MONTHLY WEATHER REVIEW.

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## INTRODUCTION.

This REVIEW for August, 1893, is based on reports from 3,087 regular and voluntary observers. These reports are classified as follows: 164 reports from Weather Bureau stations; 40 reports from United States Army post surgeons; 2,156 monthly reports from state weather service and voluntary observers; 32 reports from Canadian stations; 220 reports through the Southern Pacific Railway Company; 475 marine reports through the co-operation of the Hydrographic

Office, Navy Department; marine reports through the "New York Herald Weather Service"; monthly reports from local services established in all states and territories; and international simultaneous observations. Trustworthy newspaper extracts and special reports have also been used.

The WEATHER REVIEW for this month has been prepared under the general editorial supervision of Prof. Cleveland Abbe.

## CHARACTERISTICS OF THE WEATHER FOR AUGUST, 1893.

### TEMPERATURE.

The month was warmer than normal in the middle Atlantic and New England states, the Lake region, and in Manitoba and Alberta; it was cooler than the average August along the middle Pacific coast and on the northeast slope of the Rocky Mountains. At Eastport, Me., and Manchester, N. H., the month was the warmest August on record, and at Keesees Ferry, Ark., Eureka Ranch, Kans., Grand Coteau, La., and Fort Reno, Okla., the coolest on record.

### PRECIPITATION.

The rainfall was in excess over the greater part of the south Atlantic states. Although rainfalls of 20, 22, and 24 inches are reported from South Carolina, and although the average for that state is much in excess of the normal, yet the rainfall is not the largest on record, having been exceeded in 1885. The rainfall was deficient in the Mississippi and Ohio valleys and upper lake region.

### LOCAL WIND STORMS.

The local storms of the month have been generally small and isolated, and of the character of gusts attending thunderstorms rather than tornadoes.

Hot winds, with temperatures of 104°, 108°, and 111°, have been reported from Montana.

### HURRICANES.

Four hurricanes have approached the coast of the United States from the Atlantic Ocean, and after curving northeastward have continued on toward Europe.

The first of these appeared on the 15th at latitude 33° N.,

longitude 60° W.; passed north of the Bermudas; recurved at latitude 37° 5', and touched Newfoundland on the 18th.

The second passed near Saint Thomas and Puerto Rico on the 16th; recurved at latitude 32° 5', longitude 75°; touched Cape Hatteras and Cape Cod on the 21st.

The third was at latitude 22°, longitude 63°, on the 20th; recurved at latitude 35°, longitude 75°; passed near Cape Hatteras and Atlantic City and over New York City on the 24th; and thence to the mouth of the Saint Lawrence. Much destruction was done on the middle Atlantic coast.

The fourth was at latitude 23°, longitude 67°, on the 24th; recurved at latitude 35°, longitude 81°, in North Carolina, and passed over Newfoundland on the 30th. This storm did much destruction in the south Atlantic states. Its center passed over or near Jacksonville, Savannah, Charleston, Augusta, Charlotte, Lynchburg, Harrisburg, Ithaca, Oswego, Northfield, and Saint John, N. B. The destruction to property on shore may be estimated as approximately \$3,000,000. The loss of human life, nearly 2,000, was due principally to drowning by high water on the coast.

### DROUGHT.

The injurious drought of July continued to the middle of August, and had generally lasted from eight to eleven weeks before it was broken by rains in the middle of August in the following states: Kentucky, Illinois, Indiana, Ohio, Michigan, and Missouri.

### AURORAS.

During the night of the 6th auroral displays were noted generally over the northern and north-central parts of the country from New England to the north Pacific coast.

## ATMOSPHERIC PRESSURE (expressed in inches and hundredths).

The distribution of mean atmospheric pressure for August, 1893, as determined from observations taken daily at 8 a. m. and 8 p. m. (75th meridian time), is shown on Chart II by isobars.

Chart V exhibits the normal distribution of atmospheric pressure and normal wind movement by Lambert's formula over the United States for August, and has been prepared by Prof. H. A. Hazen, who has also prepared all the others of

this series, preliminary to the publication by the Weather Bureau of specially prepared data and charts showing the meteorological and climatic features and conditions of the United States. The pressures for the United States are reduced to sea-level by Prof. Hazen's methods and formulæ, those for Canada are reduced by Prof. Carpmæl's method.

As compared with the preceding month of July, the mean pressures for August, 1893, are lower in the south Atlantic and Gulf states, but higher over New England and the Gulf of

Saint Lawrence; also higher over the Lake region but lower in northern California, Washington, and Oregon.

As compared with the normal for August, the pressures for August, 1893, have been lower in all the Atlantic States, as also on the Pacific coast, but showing only slight variations for the rest of the United States.

#### HIGH AND LOW AREAS

The paths of the centers of high and low areas moving over the United States and Canada during August, 1893, are traced on Charts IV and I, respectively, and their principal characteristics are given in the following text and table:

#### HIGH AREAS.

I.—At 8 a. m. of the 1st this high area extended from Texas to Ontario, being central in Iowa; that afternoon and subsequent day its area was greatly extended; on the morning of the 2d it was central near Port Huron, Mich., on the 3d in Connecticut, where it remained until 8 a. m. of the 4th.

II.—Appeared 8 a. m. of the 2d off the coast of Washington where on the 3d pressure rose to 30.10, but soon again declined.

III.—Appeared 8 a. m. of the 5th in Manitoba, moving southward between low areas I and II. Central at 8 a. m. of the 6th over Lake Superior; 7th, in Lower Michigan; 8th, on Lake Erie; 9th, in Pennsylvania; 10th, in Maryland; 11th, on the south Atlantic coast.

IV.—The morning chart of the 6th shows a high pressure area on the Pacific coast, following low area II; the pressure rose on the 7th, but rapidly declined. A large area of cold air, with occasional frost, the first of the season at New Salem, N. Dak., moved eastward, and at 8 a. m. of the 11th was central in the Dakotas; 12th, in Iowa; 13th, over Lake Huron; 14th, over Lake Ontario; 15th, extended from New York to Georgia. The first heavy frost of the season occurred on the 11th at New Salem, N. Dak.; on the 12th at Cross, S. Dak.; on the 13th at Cheboygan, Mich.; on the 14th at East Templeton, Mass.; 15th, at Blooming Grove, Pa.

V.—On the morning of the 13th the pressure began to rise rapidly in Oregon and Washington, where it was highest the morning of the 14th, but rapidly declined, while an area of clear, cold weather and frost moved eastward into Wyoming and disappeared by the 17th. The first heavy frost of the season occurred on the 16th at Lander, Wyo.

VI.—The morning chart of the 19th shows high pressure on Lake Superior, which extended southward to the Ohio Valley by the 21st, the center still remaining over the upper lakes, while the hurricane, low area VIII, moved along the coast of New England. On the morning of the 22d this high area was central in western New York, and subsequently, while low area IX was moving along the middle Atlantic coast, this high area was re-inforced by a decided rise of pressure over the Canadian Maritime Provinces, so that at 8 p. m. of the 22d the center of high pressure was over Connecticut; at 8 a. m. of the 23d over Maine; at 8 p. m. of the 23d over the Bay of Fundy; and at 8 a. m. of the 24th over Cape Breton.

VII.—On the 24th the pressure began to rise in British Columbia and at 8 a. m. of the 26th the area of high pressure was central in that region, and soon covered a very large area. (The first heavy frost occurred on the 25th, at Vernonia, Oregon.) 27th, 8 a. m., pressure was highest in Assiniboia, while a ridge extended from Kansas northwestward over and beyond Alberta, and frosts were reported that morning in Montana and the next morning (28th) in northern Nebraska (first of the season at Ewing, Nebr.), North and South Dakota, and western Minnesota (first frost at Fairmont, Minn., and on the morning of the 29th at Omaha, Nebr.).

On the 29th, 8 a. m., the high pressure extended from northern Texas to Minnesota and beyond, so that the ridge trended north-northeast, showing that the northern end of the ridge had moved eastward much more rapidly than the

southern end, in accordance with the general principle that the movements of areas of high pressure, like those of low pressure, have only a general, or secondary, dependence on the surface winds and are more directly dependent on the circulation, or other movements, of the atmosphere at or above the level of the clouds. While this ridge of high pressure thus lay parallel to the Mississippi Valley, and a little to the west of it, and while its northerly winds, with clear, dry, cool weather were rapidly extending southward to the Gulf, the hurricane center, low area X, was rapidly moving from South Carolina to New York. Heavy frost at Black River Falls, Wis.; Saint Charles, Rushford, Hokah, Plainview, Carlton, and Long Prairie, Minn.; Hay Springs, Nebr.; Fayette, Iowa; Logansport, Ind.; Watertown, S. Dak.

The morning map of the 30th shows that the hurricane had passed rapidly to the Gulf of Saint Lawrence and clear weather, with high pressure, was then prevailing everywhere west of New Brunswick; light frosts were reported in Michigan at Allegan, Berrien Springs, and Grand Haven, at Galena, Ill., and Rock Rapids, Iowa; the central pressure was highest in Iowa. Nearly the same conditions prevailed on the morning of the 31st, when the highest pressure was still central in Iowa, while the northerly winds, still flowing southward into the Gulf of Mexico, were apparently contributing to the development of a whirlwind in that region. The great area covered by this high pressure, and by its out-flowing winds, although both the pressure and the winds were moderate, makes it credible that the total energy represented by the movements within the high area was greater than the energy manifested by the more intense disturbances and destructive winds of the hurricane itself.

VIII. An area of high pressure on the north or preceding side of the hurricane, low area VIII, began to develop on the 26th over the Middle and Eastern States and Canadian Provinces. Its center appears over the Bay of Fundy at 8 a. m. of the 27th, and was some distance off the east Atlantic coast at 8 a. m. of the 28th. Possibly this area represented a horizontal flow of air and a temporary extension landward of the high pressure prevailing over the Atlantic, but the motions of the winds and clouds are not sufficient to establish this hypothesis.

#### LOW AREAS.

I.—Appeared in British Columbia and Washington on the morning of the 1st, and disappeared over the Gulf of Saint Lawrence on the afternoon of the 5th; the center remained always on the northern border of the daily weather map.

II.—Appeared in British Columbia on the afternoon of the 4th, and after descending southward in a very irregular manner, appeared on the morning of the 8th as an ill-defined trough of low pressure stretching from Kansas northeastward over and beyond Minnesota, after which it disappeared from our maps; at this time it was apparently the southerly branch of low area III.

III.—Appeared on the 8th in Saskatchewan. On the 9th it rapidly stretched southward into Dakota, but returned to Ontario on the 10th, and moving eastward, passed over Maine and Nova Scotia on the 13th. The southward extension on the 9th was apparently due to mechanical causes similar to the southward extension of low area II over that same territory on the preceding day.

IV. Appeared in British Columbia on the 11th and moved southeastward on the 13th and 14th until it had passed over to Manitoba, where it formed a well-defined center of low pressure. On the morning of the 15th it was central over Lake Winnipeg, after which it disappeared. The slight depression, low area V, that formed on the 14th in Kansas is to be considered as independent of the present one, and especially due to the southward flow of air from the high barometer then advancing from the Pacific coast.



VI.—The morning chart of the 16th shows a depression extending from the interior of California northward into British Columbia. From the latter region an indefinite low area moved southeastward; it apparently filled up on the 18th and 19th only to reappear on the 20th and 21st, and the center may be located in Dakota on the morning of the 22d, whence it moved northeastward, and on the 23d turned south to Lake Superior. Leaving the latter on the 24th it disappeared in Ontario, or may possibly have merged with low area VIII.

VII.—This depression first appears on the morning chart of the 17th, when it was central near Cape Breton, but a report from Bermuda dated 4 p. m., 15th, had shown that an Atlantic hurricane was then moving northward between that station and Halifax.

VIII.—This hurricane was first announced by a special dispatch from the observer at Saint Thomas, W. I., on the morning of the 16th, at which time the center was south of that island. The center subsequently passed over Puerto Rico, its track lay midway between the Bahamas and Bermuda, touching Cape Hatteras on the 20th, Cape Cod on the 21st, central over the Bay of Fundy on the 21st, 8 p. m., and thence northeastward over Newfoundland. Subsequent reports trace this hurricane back to the 15th near Martinique, and it probably belongs to the class that are initiated by the flow of dry air northeastward from Venezuela and Guiana into the equatorial region of rain.

As soon as the first dispatch was received from Saint Thomas, a special bulletin, dated 3.30 p. m., 16th, announced:

It is probable that a so-called West India hurricane is moving westward and is about to cross the 65th meridian. The normal track of hurricanes for August would require this to recurve by Monday next (21st) before reaching the south Atlantic coast. Vessels leaving New York for New Orleans should secure sea room by keeping well out from the shore, that is, east of the Gulf Stream. Vessels leaving Gulf ports should obtain the latest telegram from the Weather Bureau observer at Key West.

On the morning of the 18th there were some indications at our south Atlantic coast stations of the presence of this storm-center, although it was then 500 or 600 miles distant, and on the 19th indications of its approach still demonstrated its very considerable distance northeast of Nassau. The general forecast at 8 p. m. of that date states:

The hurricane that was near Saint Thomas on Wednesday is now (Saturday night) apparently central about latitude 30° and longitude 72°, having reached the point of curvature northward. It may, therefore, not strike the south Atlantic coast with much severity. Vessels leaving New York for Bermuda may meet this storm on Monday.

Heavy rain prevailed during Sunday night and Monday on the middle and east Atlantic coasts. The forecast of 8 p. m. Sunday states:

The hurricane center will probably move northeastward by Monday night, after touching the North Carolina coast, and cross latitude 40° on Tuesday (22d).

But actually the center now began to move very rapidly and reached the Bay of Fundy by 8 p. m. Monday, 21st. The maximum wind was: Block Island, ne., 72; Woods Holl, ne., 60; Boston, ne., 30; Eastport, ne., 46.

IX.—On the 21st the northerly winds in the rear of low area VII extended over Florida and the eastern portion of the Gulf of Mexico, where pressure still remained below the normal, and an ill-defined area of low pressure prevailed over that region, apparently moving slowly eastward. The indications of the formation of the storm-center were noted in the general synopsis of 8 p. m., 21st, but it seems to have first begun developing rapidly on the 22d over the Gulf Stream east of the south Atlantic coast.

The storm that was felt at Cape Hatteras the morning of the 23d is now known to have come from latitude 23°, longitude 64° on August 20th, and latitude 14°, longitude 42° on August 16th as a well-defined hurricane that advanced over the mid-ocean without being recognized as such at the West Indian stations. Therefore, its remarkable growth and track until it reached New York, N. Y., were not well foreseen, and

were at once checked by the overpowering influence of the land. The path of the center appears to have been northward, passing within less than 100 miles of Cape Hatteras, and then quite exactly over Atlantic City, N. J., and New York, N. Y., at which latter place it was central on the morning of the 24th. After this, the central low pressures rapidly filled up, the winds and rain diminished as the center moved northward through New Hampshire to the mouth of the Saint Lawrence, where it disappeared on the morning of the 25th.

At 2 p. m., 24th, the following special bulletin was issued:

The storm whose center passed over New York early Thursday morning was not heralded from the West Indies, but the map of Monday evening showed a possible storm-center in process of formation, and it is quite probable that this resulted on Tuesday morning in a depression located from 300 to 500 miles east of Florida. At that time high pressure, with northeast winds, prevailed in the middle and south Atlantic states. The whirlwind thus formed then moved north, keeping to the east of Cape Hatteras on Wednesday morning and to the east of the Virginia capes on Wednesday evening, but drawing closer in shore and increasing in intensity, developing lower pressure and higher winds by the time it struck the New Jersey coast and eventually New York. Northeast gales of 52 miles occurred at Atlantic City and 56 miles at New York, shifting suddenly to southwest between midnight and 6 a. m. this morning. No reports have been received from the New England coast, where easterly gales have probably been experienced. At last accounts the storm-center had passed from the ocean on to the land and was traversing southern New England, a route which is quite unusual and will probably facilitate the breaking up of the storm.

X.—The weather map of the morning of August 25th (Friday), not only showed the disappearance of low area IX in Labrador, but also stated that "there are indications of a hurricane-center about 500 miles southeast of Florida, moving toward the northwest;" subsequent reports indicated that the center was then far north of Turks Island, possibly near latitude 25°, instead of being near that island as was at first thought. Marine reports for the 22d show very low pressure and high winds at latitude 22°, longitude 57°, suggesting that the hurricane was even then at a stage of full development. If the approximate track of the center be traced back to latitude 18°, longitude 20° on the 15th (at which time an area of high pressure was central in Germany and extended south over the Sahara), then it becomes plausible that this hurricane belongs to a class that is initiated by the flow of dry air from North African plateaus westward to the ocean.

Special dispatches on the afternoon of Friday (25th) showed that the heavy waves which extend outward in all directions from a hurricane center were already noticeable at Savannah, and probably all along the south Atlantic coast. Storm signals were at once displayed from Savannah to Wilmington, and northeast gales, with rain, predicted for Saturday; both gales and rain reached these signal stations on Sunday, so that, technically speaking, the warnings were somewhat premature, but considering the indefiniteness of our knowledge as to the location of the center of the hurricane, it was doubtless the best that could be done. The center passed 100 miles northeast of Nassau, Saturday morning the 26th, and the general forecast of that date states that:

The track of the hurricane will probably keep to the west of the two preceding tracks and bring more rain to the interior of the Atlantic States.

The special bulletin issued on the afternoon of the same date states:

The hurricane indicated in the general synopsis of 8 a. m. Friday morning as probably existing about 500 miles southeast of Florida has apparently moved west-northwest, and early this morning passed to the north of but near Nassau, in the Bahamas, where high winds prevailed all night, and at 8 a. m. the wind was brisk northwest, with the barometer at 29.56. The course of this storm-center has thus far lain to the westward of its two predecessors, and, as frequently is the case, it should therefore strike the Atlantic coast at a point farther south than did the hurricane of Wednesday last. The heavy ocean swell preceding the storm was reported Friday morning at Savannah. Northeasterly gales and general rains are indicated for Saturday night and Sunday on the coast of the south Atlantic states, including the west coast of the Florida Peninsula.

The Secretaries of the Maritime Exchanges in New York and Philadelphia and the observers at Breakwater, Baltimore, Norfolk, Boston, New York, and Philadelphia were informed

that the storm existing off the coast rendered it unsafe for vessels to leave port for the South until further notice from the Weather Bureau, as dangerous gales were likely to occur during the next forty-eight hours. The observers were notified to be prompt in giving this information to shipping interests.

On the 26th, at 8 p. m., the storm then being central north-east of Jupiter Inlet, it became safe to predict:

The hurricane center will probably strike the coast of the south Atlantic states on Sunday, pass inward, and break up into general rains on Monday.

This prediction of course assumed that the hurricane would not recurve and keep off the south Atlantic coast, and was based partly upon the little knowledge we already had as to its past course and partly upon the distribution of pressure, winds, and clouds then prevailing in the Atlantic States and Lake region, all of which favored the westward motion of the hurricane. This prediction, and the reasoning which led to it, were confirmed by the appearance of the map of Sunday morning (27th), and the general forecast of that date said:

The low center off the Florida coast will move northwest, striking the coast of Georgia Sunday evening or night, and passing inward break up into general rains over the Appalachian Mountains.

The center passed very nearly over Jacksonville and Savannah, and then inward very near to Augusta, which latter point it reached about 6 a. m. of Monday, 28th.

On Sunday special noon reports were called for from stations in the vicinity of the storm's path, and based on these reports a dispatch was sent to the President, then on the New England coast, informing him that dangerous gales prevailed on the south Atlantic coast, that the storm would extend northward and be felt on the middle Atlantic and southern New England coasts on Monday night, and that the northern ports had been warned that it was unsafe for vessels to leave port.

The forecast of 8 p. m., Sunday, although telegraphic reports were missing from Charleston to Key West, ventured on the prediction:

It will move northward over Savannah between Charleston and Augusta into North Carolina. There are indications of its breaking up in that region Monday afternoon.

These indications consisted especially in the fact that the winds which were blowing from the Atlantic coast toward the Appalachians, and those which were blowing from the Lake region, Mississippi, and Ohio valleys also toward the Appalachians, would probably produce two or more extended areas of cloud and rain, such that the heat of Monday's sunshine would spread the isobars apart and break up the storm into two areas of low pressure, one over the lower lakes and the other on the middle Atlantic coast. As the event proved, however, the dispersion thus produced was not sufficient to divide the storm as a whole, and it passed over the Appalachians between 8 p. m. of the 28th and 8 a. m. of Tuesday, 29th, when it was central in the northern part of New York.

The tendency to the formation of a new area of low pressure over the lower lake region (or rather on the western slope of the Appalachians when northerly winds prevail in that region) is almost invariably exhibited when hurricanes prevail on the Atlantic coast, and as a consequence the latter in their journey from Florida toward New Jersey are often divided and sometimes pass entirely over the western side of that range; or again, having reached New Jersey the center is retarded in its progress eastward, and may even break up over New England. These are all illustrations of the general principle that among the features controlling the motion of a cyclonic storm, one of the most important is the location of the area of formation of cloud and rain.

The strong influence of the northeast winds that were about to prevail over the lower lakes (and actually did arrive about between 3 and 8 p. m. on Monday) was anticipated Monday morning, when the weather map showed the storm-center near Augusta, and a trough of low pressure running northward into Canada, while an area of high pressure had steadily ad-

vanced southeastward into the upper Mississippi and lower Missouri valleys with cold, dry, northerly winds already prevailing over the upper lakes. The general forecast of Monday morning states:

The hurricane center will probably move north-northeast, keeping east of the Appalachian range, and producing high southeasterly winds backing to northeasterly on the middle Atlantic coast, with general rain in the middle Atlantic states.

A due north-northeast course would have carried the storm center to Oswego, and it would seem likely that after passing more nearly northward, as though it were actually about to cross over to the Lake region, the center then turned a little more to the east and was moving northeastward on the morning of Tuesday, 29th, when it was about 50 miles southeast of Oswego, while the rain areas extended farther to the west, viz., Toledo, than to the east, namely, Boston.

At 3 p. m. of Monday, the 28th, the hurricane center was a few miles northwest of Charlotte, having moved slowly since 8 a. m., but the longer axis of the oval isobars now pointed northward and the center assumed a much more rapid movement. In the afternoon the observers at Atlantic City, New Brunswick, Philadelphia, New York, New Haven, and New London were wired that severe easterly gales, heavy rains, and unusually high tides were indicated for the middle Atlantic and south New England coasts Monday night; they were also instructed to give this information to the public and to telegraph it to any postmaster on the coast where the public might be benefited.

To the postmasters at Cape May, Asbury Park, Sea Isle City, Wildewood, Beach Haven, and Barnegat City telegrams were sent giving similar information, and requesting that said information be given to the public. On the receipt of these telegrams the newspapers in some of these cities issued extra editions in order to disseminate the information, and letters of thanks were afterwards received from the Boards of Trade and public officials, acknowledging the great value of the warning.

The Secretaries of the Maritime Exchanges of New York and Philadelphia, and officials of the Baltimore and Ohio and Pennsylvania railroads in Philadelphia and Baltimore, were notified of the anticipated severity of the storm on the Atlantic coast, and observers at Raleigh, Lynchburg, Charlotte, Norfolk, Harrisburg, Baltimore, and the Chamber of Commerce at Richmond were informed that the rains attending the storm were likely to cause dangerous floods. At 8 p. m. so many observations were missing, owing to the interruption of telegraphic communication, that it was not practicable to make any general prediction of the future course of the hurricane center other than those already made as to its general northeasterly course; but at that moment it was actually raining, with northeast winds, over the whole of West Virginia, western Pennsylvania, western New York, and northeastern Ohio, which condition shows how strong was the tendency toward the formation of low barometer on the west side of that mountain range, while on the south and east sides it was raining, with southeasterly winds, only in a narrow belt from Raleigh to Lynchburg and Washington; the motion of the clouds showed that at that moment the movement of air over the Atlantic States was from the southwest and therefore not tending to especially increase the rainfall, either as to intensity, area, or quantity, and a similar condition prevailed on the west side of the Appalachians, except only over Lake Ontario.

The map at 8 a. m. Tuesday, 29th, was practically blank, as telegraphic communication was cut off in all directions. But the subsequent reports show that the center was at that moment near Oswego, having moved at the remarkable rate of 450 miles in twelve hours, and the elongated isobars suggest that within that interval a long trough of low pressure had been formed, stretching from Lynchburg to Oswego, and that the isobars of 8 a. m., 29th, represent the rapid filling up of the southern end of that trough and the transfer of the



storm-center from Lynchburg to Oswego rather than the movement of a well-defined whirlwind at a rapid rate over this mountainous country. The isobars and winds of Tuesday morning show that we have no longer to do with a symmetrical revolving hurricane, but with two, if not three, systems of winds blowing into the region of low pressure and each striving to set up its own independent whirl, namely, southerly winds from New Jersey to Massachusetts, westerly winds in Pennsylvania, and northeasterly winds in Vermont, the Saint Lawrence Valley, and Lake Ontario. Although, as before stated, the weather map was a blank north and west of Maryland and Virginia, yet it was evident that the storm-center had now rapidly passed northward of Maryland; by prediction it should be at least as far north as the boundary between New York and Pennsylvania, and the following general synopsis and forecast was ventured:

The hurricane is probably central in Pennsylvania. The storm-center will move northeast through New York state into the Saint Lawrence Valley.

The map for 8 p. m., 29th, shows that the center was then a little east of Quebec, and possibly within the border of Maine, having moved about 350 miles or more within twelve hours; the isobars now exhibit the great elongation characteristic of the breaking up of a storm. The general conditions and forecast read as follows:

The central calm area has become a long oval, with southwesterly winds on its east side from Massachusetts to the Gulf of Saint Lawrence, and northeasterly winds on its west side at Canadian stations. The current wind velocities average about one-half of those prevailing Monday night. The storm will probably move northeast to Labrador, and may possibly become again powerful after reaching the Atlantic.

The text on the map of 8 a. m. Wednesday, 30th, states that:

The hurricane has moved northeastward down the Saint Lawrence Valley and is now central near the mouth of that river.

Subsequent marine reports do not show the presence of any special storm-center east of Labrador and Newfoundland, and it is probable that this powerful whirl was broken up as such on the 1st of September.

XI.—While the preceding, low area X, was on the 28th passing from Augusta to Lynchburg, the northerly winds and dry air in the Mississippi Valley and the Southwest extended rapidly southward over the Gulf. We have as yet no evidence of the existence therein of any low barometer and cyclonic winds on Monday, but the moderate norther of Monday in the western Gulf, combined with the southerly winds in the eastern Gulf, favored the formation of a moderate barometric depression in the central Gulf which seemed to have prevailed without any general progressive movement from that time until 8 p. m. of the 31st. During these three days the pressure at Port Eads was generally lower than at New Orleans or Mobile, and the tendency toward local and general storms was daily manifest. At one time it was thought that a hurricane would evolve itself out of this indefinite condition, and accordingly at 8 p. m. of the 30th

storm-warning signals were displayed from Port Eads eastward to Savannah, but no general storm resulted, although local gusts, waterspouts, and thunderstorms were reported. These conditions continued over into September.

XII.—On the 24th, 8 a. m., a depression apparently existed in northern Alberta, although in fact there was a general depression along a large portion of the Rocky Mountain and Pacific coast regions. The map for 8 p. m. locates a central depression in southern Alberta. This depression stretched southward over California, Mexico, and Texas, although its center continued moving eastward along our northern border. On the 27th, at 8 p. m., it was central between James Bay and Lake Huron, while the hurricane, low area X, was on the coast of Georgia. The subsequent path of that hurricane carried it northward rapidly, and it may be said to have become united with the present low area by 8 a. m. of the 29th. It would, however, be a mistake to speak of this junction as an illustration of the tendency of two cyclones to run into each other and unite. It would seem more proper rather to consider the present indefinite depression, low area XII, as a valley between the two high areas that were on the 27th central over the Rocky Mountain plateau and Nova Scotia, respectively. The movement of low area X was controlled by the nature of the air supplied to it from these two areas of high pressure.

XIII. An indefinite area of low pressure appears on the afternoon of the 30th in Assiniboia and Saskatchewan, by the morning of the 31st it was north of Lake Superior, and its further development belongs to September.

#### Movements of areas of high and low pressures.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	Miles.	Days.	Miles.	Miles.
I.....										
II.....										
III.....	5, a. m.	51	94	11, a. m.	31	80	1,700	6.0	280	11.7
IV.....	6, a. m.	47	127	15, a. m.	43	76	2,700	9.0	300	12.5
V.....										
VI.....	19, a. m.	44	86	23, a. m.	46	61	1,600	4.0	400	16.7
VII.....	24, a. m.	50	127	31, a. m.	43	92	2,200	7.0	315	13.1
Mean.....								6.5	324	13.5
Low areas.										
I.....	1, a. m.	51	121	5, p. m.	49	67	2,600	4.5	578	24.1
II.....	4, p. m.	53	120	8, a. m.	48	96	1,400	4.0	350	14.6
III.....	8, a. m.	55	110	13, p. m.	45	63	2,600	5.5	473	19.7
IV.....										
V.....	14, p. m.	39	101	18, p. m.	41	72	1,600	4.0	400	16.6
VI.....	17, a. m.	52	121	24, p. m.	46	83	2,900	7.5	399	16.6
VII.....	15, a. m.	33	60	17, p. m.	43	56	1,000	2.5	400	16.6
VIII.....	16, a. m.	16	65	22, a. m.	48	60	2,700	6.0	450	18.8
IX.....	21, p. m.	29	85	25, a. m.	50	65	2,400	3.5	690	25.0
X.....	22, a. m.	23	58	30, a. m.	48	63	3,300	8.0	413	17.2
XI.....										
Mean.....								5.1	462	19.9

#### NORTH ATLANTIC STORMS FOR AUGUST, 1893.

[Pressure in inches and millimeters; wind-force by Beaufort scale.]

The paths of storms that passed over the western portion of the north Atlantic Ocean are shown on Chart I, so far as can be traced from information received up to the 25th of September, through the co-operation of the Hydrographic Office and the "New York Herald Weather Service."

The normal pressure for August over the north Atlantic Ocean, as shown by the international simultaneous meteorological observations, is highest, 30.20 (767), in an oval extending from W. 24° to N. 37° to W. 48° to N. 32°; pressure is lowest, 29.70 (754), in a small oval north of Iceland and a second small oval at the northwestern extremity of Baffins Bay.

As compared with July the mean pressure for the current

August is higher on the east Atlantic coast, as also in northern Greenland and the extreme northern part of the Atlantic Ocean. The pressure is lower throughout the eastern part of the Atlantic Ocean.

The tracks of storm-centers for August in their passage from the east Atlantic coast toward the coasts of Great Britain and Norway have an average velocity of about 23 statute miles per hour, but the velocity of those moving from the West Indies toward the south Atlantic coast is about 18 miles. The tracks of storms for August may be classified as (I) those which pass up the Gulf Stream over Newfoundland, north of Scotland over Norway and the Gulf of Finland into

the interior of Russia. (II) Those that pass from Bering Sea over southern Alaska, British Columbia, Manitoba, Lake Superior, and Newfoundland, where their track joins that of the preceding class. These storms from Bering Sea have generally pursued an earlier course northeastward along the coasts of China, Japan, and Corea, and in this part of their history resemble the above-mentioned first class which had pursued a northeastward course along the Atlantic coast of the United States. (III) Storms of a third class, comparatively rare, are those that originate in the east Atlantic and, after a short passage westward, recurve toward Portugal, France, and England, where they join the track of those of the first class. (IV) A similar class of infrequent storms originating in the same way includes those that after recurving northeastward strike the Pacific coast of Mexico and California.

During August, 1893, the following storms have been traced over portions of the north Atlantic Ocean; the centers are located for Greenwich noon by simultaneous observations:

A. This storm passed north of Great Britain on August 1st, and over southern Norway and Sweden on the 2d.

B. Was north of Great Britain on the 3d and 4th, and reached Sweden on the 5th.

C. Left the Straits of Belle Isle on the 3d; was at N. 52°, W. 47° on the 4th; N. 55°, W. 30° on the 5th; N. 55°, W. 20° on the 6th; N. 60°, W. 10° on the 7th, after which it moved northward more rapidly, and an area of high pressure moved from the southeastward up over Europe.

D. This whirl apparently developed at the southwest edge of the trough of low pressure attending the preceding; its center may be located as follows: N. 50°, W. 40° on the 5th; N. 51°, W. 31° on the 6th; N. 53°, W. 22° on the 7th; N. 52°, W. 17° on the 8th; N. 50°, W. 18° on the 9th, after which it merged into the greater depression immediately following it.

E. This first appears as a decided low pressure, followed by heavy northwest gales in N. 54°, W. 42° on the 9th; N. 53°, W. 32° on the 10th, with the formation of still another area of low pressure and a special whirl to the westward; N. 56°, W. 20° on the 11th.

F. The track of this can be located as follows: N. 53°, W. 42° on the 10th; N. 50°, W. 37° on the 11th; N. 52°, W. 33° on the 12th; N. 51°, W. 30° on the 13th.

G. There was another whirl of this series that originated in the north Atlantic, and was located as follows: N. 47°, W. 36° on the 14th; N. 51°, W. 33° on the 15th; N. 53°, W. 28° on the 16th; N. 55°, W. 22° on the 17th; N. 59°, W. 20° on the 18th, after which the storm passed over the northern Hebrides and involved a large area in a general whirl whose center was at N. 60°, W. 20° on the 19th, while an area of high pressure advanced from the southeast over Europe and the Mediterranean. The center was about N. 60°, W. 15° on the 20th, and N. 57°, W. 12° on the 21st, and N. 62°, W. 8° on the 22d, after which it passed on to the coast of Norway, and on the 24th had divided into two whirls over the North Sea and the Baltic Sea, respectively; the latter passed southeast into the interior of Russia, being central on the 26th near Saint Petersburg. This low pressure was followed by an area of high barometer, which, on the 23d and 24th, stretched from southern Europe westward to the Atlantic, and thence northward on the 25th to Ireland; pressure remained highest over Great Britain on the 26th to the 31st, being at that time between the Russian area of low pressure and the hurricane that was advancing northeastward over the United States, thereby illustrating the general principle that when a great area of high pressure descends upon the earth's surface it stimulates the development of low pressures and storms on all sides as its denser air is pushed outward along the earth's surface. The northerly winds and heavy sea in the rear of this whirl (G) were very severe on the 20th to 22d. A hurricane is said to have passed over the Azores on the 23d, doing

great damage, but the marine reports give no intimation of such a storm, and it may have been only a short-lived whirlwind.

H. A hurricane passed on the northeast side of the Bermudas on the 15th and touched the coast of Nova Scotia on the 17th; it is low area VII in the list of United States storms. After that date its path is quite uncertain; it was central at N. 46°, W. 57°, 17th, noon, Greenwich time, and on the 18th at N. 48°, W. 52°, after which it becomes lost or merges into the extensive whirl G.

I. The hurricane, low area VIII of the United States storms, that passed over Puerto Rico, August 27, touched Cape Hatteras on the 20th, and the Gulf of Saint Lawrence on the 22d. The locations of its center were, approximately, N. 38°, W. 69°, on the 21st; N. 46°, W. 58°, 22d; N. 52°, W. 48°, 23d; N. 49°, W. 40°, 24th; N. 50°, W. 35°, 25th. After which latter date it seems to have died out in the presence of the high area which was then central west of Ireland.

K. The hurricane that passed over Savannah on the 27th and 28th and reached the Canadian Maritime Provinces on the 30th (United States low area X), was felt as early as the 22d at N. 22°, W. 56°, where a pressure of 28.70 (729) is reported. Its earlier history is as yet problematic, but it is likely to be similar to that of the great Nova Scotia hurricane of August, 1873; both of these seem to have been started by a flow of dry air from northern Africa westward into the ocean. The center passed to the northeast of Newfoundland on the 31st, at which time high pressure prevailed from Ireland westward to the mid-Atlantic, and the storm probably pursued a northerly course, but its subsequent history belongs to the month of September.

#### OCEAN ICE IN AUGUST.

The following table shows the southern and eastern limits of the region within which icebergs or field ice were reported for August during the last 12 years:

Southern limit.			Eastern limit.		
Month.	Lat. N.	Long. W.	Month.	Lat. N.	Long. W.
August, 1882.....	46 50	46 00	August, 1882.....	46 50	46 00
August, 1883.....	43 26	51 41	August, 1883.....	48 00	44 00
August, 1884.....	43 24	48 44	August, 1884.....	47 50	43 50
August, 1885.....	43 45	52 04	August, 1885.....	48 03	42 45
August, 1886.....	48 35	48 46	August, 1886.....	50 00	48 00
August, 1887.....	42 21	49 51	August, 1887.....	48 06	40 00
August, 1888.....	Straits of Belle Isle		August, 1888.....	51 33	55 00
August, 1889.....	43 34	48 38	August, 1889.....	53 00	45 00
August, 1890.....	42 30	50 21	August, 1890.....	50 13	39 10
August, 1891.....	44 07	52 05	August, 1891.....	47 32	42 45
August, 1892.....	46 45	53 00	August, 1892.....	48 43	44 49
August, 1893.....	44 53	49 21	August, 1893.....	46 28	46 02
Mean.....	44 34	50 03	Mean.....	48 01	44 46

\* Isolated field ice in N. 58°, W. 40°.

The above table shows that for August, 1893, ice was reported about the average southern limit of ice for the corresponding month of the last 11 years. The position of easternmost ice reported for the current month was about 14° east of the average eastern limit for August.

The limits of the region within which icebergs or field ice were reported for August, 1893, are shown on Chart I by ruled shading.

#### OCEAN FOG IN AUGUST.

The limits of fog-belts west of the 40th meridian, as reported by shipmasters, are shown on Chart I by dotted shading.

Near the Banks of Newfoundland fog was reported on 24 dates; between the 55th and 65th meridians on 19 dates and west of the 65th meridian on 18 dates. Compared with the corresponding month of the last 5 years, the dates of occurrence of fog near the Grand Banks numbered 3 more than the average; between the 55th and 65th meridians 7 more than the average; and west of the 65th meridian 8 more than the average.



## TEMPERATURE OF THE AIR (expressed in degrees Fahrenheit).

The distribution of mean temperature over the United States and Canada for August, 1893, is shown by the dotted isotherms on Chart II; the lines are, however, not drawn for the higher irregular surface of the Rocky Mountain plateau; the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country over which they are drawn; in mountainous regions, such isotherms would be controlled largely by the topography, and it is, therefore, not practicable to present the temperature data in this manner unless a contour map on a large scale is published as a base chart.

In the table of meteorological data from voluntary observers, the actual mean temperature is given for each station, and in the table of climatological data, both the mean temperatures and the departures from the normal are given for the regular stations of the Weather Bureau. In the latter table the stations are grouped by geographical districts, for each of which is given the average temperature and departure from the normal. The normal for any district or station may be found by adding the departures to the current average when the latter is below the normal and by subtracting when it is above.

For regular stations of the Weather Bureau the monthly mean temperature is the simple mean of all daily maxima and minima; for voluntary stations a variety of methods of computation is necessarily allowed, as shown by the notes appended to the tabulated meteorological record.

During August, 1893, the mean temperature was highest in the lower Colorado valley and adjacent country, where it ranged from 91 to 103; it was above 85 over a large part of southern and central California; it was between 80 and 85 over the greater part of Texas; it was at or above 80 in Florida and the southern portion of the east Gulf states. The mean temperature was lowest, viz., from 55 to 60, along the Pacific coast from San Francisco, Cal., to Vancouver Island, and again from the mouth of the Saint Lawrence westward to the northern coast of Lake Superior, and thence northward through northern Manitoba, Saskatchewan, and northern Alberta. The mean temperature varied from 65 to 75 at stations in the lowlands of the Rocky Mountain plateau region.

## DEPARTURES FROM NORMAL TEMPERATURE.

The mean temperature for August was from 1 to 2 above the normal in the middle Atlantic states and New England, and about 1 over the Lake region, and 2 from Manitoba to Alberta. It was below the normal on the Pacific coast and the east Rocky Mountain slope; the greatest deficit being 3.7 at San Francisco, Cal., and 2.2 at Colorado Springs, Colo.; the greatest excess was 4.2 at Chatham, N. B.

The following table shows for certain stations, as reported by voluntary observers, (1) the normal temperature for August for a series of years; (2) the length of record during which the observations have been taken, and from which the normal has been computed; (3) the mean temperature for August, 1893; (4) the departure of the current month from the normal; (5) the extreme monthly mean for August during the period of observation and the years of occurrence:

State and station.	(1) Normal for the month of Aug.	(2) Length of record.	(3) Mean for Aug., 1893.	(4) Departure from normal.	(5) Extreme monthly means for August.			
					Highest.	Year.	Lowest.	Year.
<i>Arizona.</i>	°	Years	°	°	°		°	
Fort Apache .....	72.4	20	71.0	- 1.4	77.1	1877	67.9	1884
Fort Mohave .....	93.6	22	93.8	+ 0.2	98.8	1875	89.9	1890
Whipple Barracks .....	72.5	22	69.0	- 3.5	78.9	1879	67.8	1891
<i>Arkansas.</i>								
Keesees Ferry .....	77.9	11	74.4	- 3.5	81.0	1886	74.4	1893
<i>California.</i>								
Fort Bidwell .....	70.3	22	69.4	- 0.9	73.9	1878	62.6	1876
Riverside .....	77.4	11	.....	.....	81.5	1885	73.6	1887

## Departures from normal temperature—Continued.

State and station.	(1) Normal for the month of Aug.	(2) Length of record.	(3) Mean for Aug., 1893.	(4) Departure from normal.	(5) Extreme monthly means for August.			
					Highest.	Year.	Lowest.	Year.
<i>Colorado.</i>	°	Years	°	°	°		°	
Las Animas .....	73.6	10	71.4	- 2.2	77.1	1889	70.4	1884
<i>Florida.</i>								
Merritts Island .....	81.1	11	82.4	+ 1.3	83.8	1883	77.9	1892
<i>Georgia.</i>								
Forsyth .....	78.8	19	79.5	+ 0.7	82.4	1878	73.2	1885
<i>Idaho.</i>								
Boise Barracks .....	72.2	19	71.4	- 0.8	75.1	1878	67.3	1881
Fort Sherman .....	66.2	9	66.8	+ 0.6	68.0	1891	63.7	1889
<i>Indiana.</i>								
Lafayette .....	70.4	11	72.3	+ 1.9	74.0	1886	68.2	1885
<i>Indian Territory.</i>								
Fort Supply .....	79.1	14	76.0	- 3.1	90.8	1874	76.0	1882, 1893
<i>Iowa.</i>								
Cresco .....	68.7	20	67.4	- 1.3	72.6	1881	63.1	1885
<i>Kansas.</i>								
Eureka Ranch .....	77.2	10	73.2	- 4.0	80.8	1889	73.2	1893
Independence .....	77.8	21	75.3	- 2.5	85.8	1874	72.6	1884
Salina .....	77.5	11	.....	.....	81.7	1888	74.2	1883
<i>Louisiana.</i>								
Grand Coteau .....	81.1	9	78.7	- 2.4	83.6	1883	78.7	1893
<i>Maine.</i>								
Orono .....	65.3	23	65.8	+ 0.5	67.5	1881	63.1	1874
<i>Maryland.</i>								
Cumberland .....	71.5	22	72.2	+ 0.7	75.7	1871, 1872	68.5	1883
<i>Michigan.</i>								
Kalamazoo .....	69.4	16	71.1	.....	73.0	1881	63.8	1885
<i>Missouri.</i>								
Sedalia .....	77.0	12	74.2	- 2.8	85.4	1881	72.6	1891
<i>Montana.</i>								
Fort Custer .....	69.8	12	72.9	+ 3.1	73.8	1891	66.2	1885
<i>Nebraska.</i>								
Fort Robinson .....	69.9	10	69.7	- 0.2	74.5	1886	64.7	1888
Genoa (near) .....	72.5	17	71.1	- 1.4	77.6	1881	68.5	1885
<i>Nevada.</i>								
Browns .....	80.2	21	.....	.....	84.3	1892	76.5	1871
Carson City .....	69.3	17	66.0	- 3.3	72.4	1878	63.8	1876
<i>New Hampshire.</i>								
Hanover .....	66.2	20	64.8	- 1.4	70.4	1881	59.2	1885
<i>New Mexico.</i>								
Fort Wingate .....	70.2	22	.....	.....	76.7	1877	65.8	1887
<i>New York.</i>								
Cooperstown .....	66.4	22	64.5	- 1.9	71.5	1877	62.4	1889
Plattsburg Barracks .....	67.7	22	65.4	- 2.3	71.3	1872	64.3	1885, 1888
<i>North Carolina.</i>								
Lenoir .....	73.2	20	72.1	- 1.1	77.0	1877	70.0	1890
<i>Oklahoma.</i>								
Fort Reno .....	78.6	9	75.2	- 3.4	83.2	1886	75.2	1893
Fort Sill .....	80.6	22	77.5	- 3.1	91.0	1874	75.0	1892
<i>Oregon.</i>								
Bandon .....	57.5	9	56.0	- 1.5	61.1	1891	54.4	1886
<i>Pennsylvania.</i>								
Dyberry .....	64.9	22	66.1	+ 1.2	68.3	1872	61.2	1889
Grampan .....	67.9	22	67.6	- 0.3	73.1	1881	64.4	1873
Wellsboro .....	65.3	14	63.2	- 2.1	71.3	1881	62.0	1891
<i>South Carolina.</i>								
Statesburg .....	76.7	12	75.2	- 1.5	79.7	1881	73.5	1889
<i>South Dakota.</i>								
Fort Sully .....	73.0	22	74.7	+ 1.7	77.4	1871	67.6	1885
<i>Texas.</i>								
Austin .....	83.7	20	84.8	+ 1.1	86.5	1874, 1886	80.0	1880
Silver Falls .....	78.6	7	77.4	- 1.2	81.4	1887	74.8	1888
<i>Utah.</i>								
Terrace .....	77.4	19	77.1	- 0.3	83.8	1888	65.6	1872
<i>Vermont.</i>								
Stratford .....	67.4	20	65.2	- 2.2	72.6	1884	63.9	1885
<i>Virginia.</i>								
Dale Enterprise .....	74.5	13	70.4	- 4.1	77.5	1888	67.0	1890
<i>Washington.</i>								
Fort Townsend .....	61.4	20	59.3	- 2.1	64.3	1874	58.9	1876
<i>Wisconsin.</i>								
Embarrass .....	67.6	22	.....	.....	73.0	1876	64.0	1885, 1890
Madison .....	69.6	22	67.6	- 2.0	73.2	1881	64.2	1885
<i>Wyoming.</i>								
Fort Washakie .....	64.8	11	64.8	- 3.6	72.2	1881	64.1	1888

## TEMPERATURE, JANUARY TO AUGUST, 1893.

For the period January 1 to August, 31, 1893, the temperature averaged about normal in the Gulf States and over the southern plateau region. In New England, the upper Mississippi valley, over the northern plateau region, and along the north and middle Pacific coasts the temperature averaged 2 to 3 below, and in the middle and south Atlantic states, the Ohio Valley and Tennessee, the Lake region, the Missouri Valley, on the northeast and middle-eastern slopes of the Rocky Mountains, and along the south Pacific coast it averaged 1 below the normal. In the extreme northwest and on the southeast slope of the Rocky Mountains the mean temperature was 1 to 2 above the normal for the period named.

## YEARS OF HIGHEST MEAN TEMPERATURE FOR AUGUST.

The mean temperature for August, 1893, was the highest on

record at Eastport, Me., and Manchester, N. H., and was respectively +1.5 and plus +0.6 above the normal. The highest mean temperature for August occurred generally along the Pacific coast in 1891; over the east part of the middle and southern plateau regions in 1889; over the northern plateau region in 1888; on the northeast slope of the Rocky Mountains in 1882; generally in the central valleys in 1881; in the south Atlantic states and the upper lake region in 1878, and in the middle Atlantic and New England states in 1872.

#### YEARS OF LOWEST MEAN TEMPERATURE FOR AUGUST.

At Keesees Ferry, Ark., Eureka Ranch, Kans., Grand Coteau, La., and Fort Reno, Okla., the mean temperature for the current month was lower, and at Fort Supply, Ind. T., it was as low as ever reported for August during the respective periods of observation. The lowest mean temperature for August was noted on the south Atlantic coast in 1889; generally over the northern districts east of the Rocky Mountains in 1885; over the east part of the middle and southern plateau regions in 1884; over the western plateau region, Oregon, and northern California in 1881; on the south Pacific coast and in the lower Rio Grande valley in 1880; in the interior of the east Gulf states in 1879; in Tennessee and Kentucky in 1875; and in the middle Atlantic and New England states in 1874.

#### MAXIMUM TEMPERATURE.

The highest temperature reported by a regular station of the Weather Bureau was 111, at Yuma, Ariz., on the 2d. Maximum temperatures exceeded 100 in central California, southern Arizona, the northeastern half of Montana and western half of the Dakotas. The lowest maximum was 64 at Eureka, Cal., 79 at Block Island, R. I., and 81 at Nantucket, Mass.

#### MINIMUM TEMPERATURE.

Minimum temperatures of less than 40 were registered at all stations in southern Idaho, eastern Montana, Wyoming, the Dakotas, and western Nebraska; these usually occurred on the 15th and 16th or 27th and 28th. Similar minima probably occurred at Canadian stations in the Saint Lawrence Valley, as a minimum of 36 is reported from Northfield, Vt. Minimum temperatures of 70 or more were registered at Galveston, Tex., New Orleans and Port Eads, La., Tampa, Jupiter, and Key West, Fla.

#### RANGES OF TEMPERATURE.

The greatest daily range of temperature is given for each station in the table of data for Weather Bureau stations. The monthly ranges, or the difference between the monthly maximum and minimum, have been largest in Dakota and Montana, viz., 69 at Havre, Mont.; 67 at Miles City, Mont., and Fort Buford, N. Dak., and 66 at Bismarck, N. Dak.; the smallest monthly ranges have been Eureka, Cal., 17; Sacramento, Cal., 22; Galveston, Tex., and New Orleans, La., 21; Port Eads, La., and Key West, Fla., 20; Hatteras, N. C., and Nantucket, Mass., 21. From these outlying stations the monthly averages increase as we proceed inward toward Montana.

#### FROST.

Frost injurious to vegetation was reported as follows: 6th, Crandon, Wis., fruit and potato vines killed. 7th, Montpelier, Ohio, vines on lowlands killed. 11th, New Salem, N. Dak., damage to garden vegetation, corn, and late wheat on low ground. 12th, Cross, S. Dak., tender plants, potatoes, and vines killed. 13th, slight damage caused about 10 miles south of Cheboygan, Mich. 14th, East Templeton, Mass., tender vegetation killed and corn injured. 15th, Blooming Grove, Pa., some corn and buckwheat injured. 16th, Lander, Wyo., tomato vines and tender vegetation injured. 25th, Vernonia, Oregon, tender vegetation on lowlands damaged. 28th, Ewing, Nebr., melon and tomato vines killed. 29th, Logansport, Ind., corn on low ground killed; Fayette, Iowa, considerable damage to vegetation on low ground; Long Prairie, Minn., vegetation in exposed places slightly damaged; Saint Charles, Minn., corn, fruit, and buckwheat vines killed; Watertown, S. Dak., garden vegetation killed; Hay

Springs, Nebr., corn slightly damaged. 30th, Galena, Ill., corn badly injured; Allegan, Mich., corn killed; Grand Haven and Berrien Springs, Mich., vegetation on low ground damaged; Rock Rapids, Iowa, corn on low ground injured.

The first light frost of the season was reported as follows: 4th, Stamford, Colo.; Berlin Mills, N. H. 5th, Sharon, Wis. 6th, Albion, Arbela, and Lewiston, Mich.; Vernonia, Oregon; Florence, Grantsburg, Medford, Oconomowoc, and Oconto, Wis. 7th, Sycamore and Winnebago, Ill.; Birch Run, Evart, Grayling, and Howell, Mich.; Fife and Lone Rock, Oregon; Harvey, Meadow Valley, and Valley Junction, Wis. 8th, Crystal Falls, Hart, and Manistee (near), Mich.; Green Hill, Ohio; Colfax and Rosalia, Wash. 9th, Sandy Lake Dam, Minn. 10th, Bedford, Mass.; Luverne, Minn.; Cranes Ranch, Nev.; Oakdale, N. H.; Washburn, N. Dak.; Spokane (near), Wash.

11th, Mason City, Iowa; Great Barrington, Taunton, and Winchendon, Mass.; Bismarck (near), Dunseith, Napoleon, and Williamsport, N. Dak.; Heber, Utah. 12th, Black River Falls, Wis. 13th, Alpena, Boon, Lathrop, and Mottville, Mich.; Dublin, N. H.; Scofield, Utah. 14th, West Simsbury, Conn.; Alstead, Lancaster, Peterboro, Stratford, and West Milan, N. H.; Alfred Center, Brookfield, Cooperstown, Elmira, Factoryville, Friendship, Humphrey, Lebanon Springs, New Lisbon, and South Canisteo, N. Y.; Sparta, Oregon; Wellsboro, Pa.; Hyde Park, Northfield, Norwich, and Strafford, Vt. 15th, Vale, Oregon; Pullman, Wash.; Saratoga and Sundance, Wyo. 16th, Pagoda (near), Colo.; Snowville, Utah; Cheyenne and Sheridan, Wyo.

19th, Ashland and Menomonie, Wis. 21st, Millport, Ohio. 22d, Kennedy, Nebr. 23d, De Smet, S. Dak.; Singletree, Utah. 25th, Dassel, Minn.; East Portland and Glenora, Oregon; Aberdeen, S. Dak. 27th, Beardley, Minn.; Havre, Mont.; Bassett, Gering, and Whitman, Nebr.; Ellendale and Jamestown, N. Dak.; Bowdle, Parker, and Piedmont, S. Dak.; Koenig, Wis. 28th, Julesburg, Colo.; Alta, Panama, Rock Rapids, and Vinton, Iowa; Belle Plaine, Grand Meadow, Hastings, Moorhead, and Rochester, Minn.; Agee, Callaway, Cornlea, Lynch, North Loup, Ravenna, and Valentine, Nebr.; Ashley, Berlin, Cannon Ball, Churchs Ferry, Forman, Gallatin, Larimore, Reynolds, Saint Johns, and Woodbridge, N. Dak.; Faulkton, Flandreau, Forestburg, Howard, Huron, Kimball, Plankinton, Rapid City, Rosebud, Sioux Falls, Watertown, and Wolsey, S. Dak.; Pepin, Wis.

29th, Zuck, Colo.; Algona, Ames (near), Audubon, Charles City, Eagle Grove, Emmetsburg, Fulton, Galva, Grand Meadow, Greenfield, Humboldt, Iowa Falls, Larrabee, Marshall, Murray, Osage, Villisca, Webster City, Williams, and Winterset, Iowa; Macksville, Kans.; Lausing and Marquette (near), Mich.; Albert Lea, Alma City, Bingham Lake, Camden, Carver, Clear Lake, Fergus Falls, Granite Falls, Long Prairie, Maple Plain, Park Rapids, Princeton, Red Wing, Saint Peter, Wabasha, and Wadena, Minn.; Creighton, Harting, Hay Springs, and Norfolk, Nebr.; Gary and Yankton, S. Dak.; Amherst, Baraboo, Centralia, Eau Claire, Hammond, La Crosse (near), Shawano, Sparta, and Viroqua, Wis.

30th, Philo and Rantoul, Ill.; Ashboro, Crawfordsville, Lafayette, and Rockville, Ind.; Dubuque, Glenwood, and Monticello, Iowa; Albion, Alma, Ball Mountain, Benton Harbor, Bronson, Climax, Grand Haven, Hanover, Hastings, North Marshall, Parkville, Paris, Port Huron, and Thornville, Mich.; Farmington, Minn.; Gallatin and Platte River, Mo.; Weeping Water, Nebr.; Kenton, Ohio; Belleville, Cadiz, Columbus, Fond du Lac, Hillsboro, and Watertown, Wis. 31st, Flint, Mich.; Wild Rice, N. Dak.

The first heavy frost of the season was reported as follows: 6th, Barron, Butternut, and Crandon, Wis. 7th, Montpelier, Ohio. 11th, New Salem, N. Dak. 12th, Cross, S. Dak. 13th, Cheboygan (near), Mich.; East Templeton, Mass.; Littleton, N. H. 15th, Blooming Grove, Pa.; Randolph, Utah. 16th, Lander and Laramie, Wyo. 27th, Britton, S. Dak. 28th,



Ewing, Nebr.; De Smet, S. Dak.; Meadow Valley, Wis. 29th, Logansport, Ind.; Fayette and Rock Rapids, Iowa; Medford and Saint Charles, Minn.; Watertown, S. Dak.; Ashland,

Black River Falls, Grantsburg, Medford, Neillsville, Valley Junction, and Weston, Wis. 30th, Allegan and Berrien Springs, Mich.; Rea, Mo.

### PRECIPITATION (expressed in inches and hundredths).

The distribution of precipitation over the United States and Canada for August, 1893, as determined from reports of more than 2,000 stations, is exhibited on Chart III. In the table of miscellaneous meteorological data the total precipitation and the departure from the normal are given for regular stations of the Weather Bureau. The figures opposite the names of the geographical districts in the columns for precipitation and departure from the normal show, respectively, the averages for the several districts. The normal for any district may be found by adding the departure to the current mean when the precipitation is below the normal and subtracting when above.

The precipitation for August is usually greatest along the eastern coast of the Gulf of Mexico, where it exceeds 8.00, and the normal amount exceeds 6.00 along the immediate south Atlantic and middle Gulf coasts. In the Atlantic coast states, all areas in the western lake region and upper Mississippi valley, and in the mountain regions of central New Mexico and southeastern Arizona 4.00 to 6.00 is usually recorded. In all districts east of the Rocky Mountains, and in areas in the southern plateau region, the precipitation for August generally exceeds 2.00. Over the western plateau and Pacific coast districts the monthly average is less than 1.00, save on the extreme north Pacific coast, where it exceeds 2.00. Over a great part of the western plateau region, and in the middle and south Pacific coast states, there is usually an almost entire absence of precipitation in August.

The precipitation for August, 1893, was greatest in South Carolina, and exceeded 10 throughout the coast region of Georgia, half of South Carolina, the interior and southern half of North Carolina; small regions of 10-inch rainfall occur in the center of the Florida Peninsula, in southeastern Alabama, in southern Louisiana, western New Jersey, northern New York, and northern Tennessee. Less than 2 fell in Michigan, southern Wisconsin, eastern Iowa, central Missouri, western Tennessee, western Ohio, Kentucky, Indiana, and Illinois, as also over the southern half of Texas, the Rocky Mountain plateau, and the Pacific coast. No rain whatever seems to have fallen in central and northern California, northern Nevada, western Idaho, eastern Washington, and Oregon.

#### DEPARTURES FROM NORMAL PRECIPITATION.

Rainfall was in excess of the normal over the greater part of the south Atlantic states, and was about twice the usual quantity on the South Carolina coast. An excess of from 1 to 4 is generally reported from New York and the New England States. A deficiency of 2 or 3 in the Mississippi Valley, Ohio Valley, and upper lake region. An excess of 1 or 2 is reported from northern Texas, but a deficiency from southern Texas.

Considered by districts the monthly precipitation averaged about normal in the middle Atlantic and east Gulf states, the Ohio Valley and Tennessee, over the northern plateau, and on the middle and south Pacific coasts. In districts where the precipitation was in excess, the average percentage of the normal was about as follows: southern plateau region, 164; southeast slope of the Rocky Mountains, 142; south Atlantic states, 133; middle plateau region, 124; lower lake region, 117; New England, 116. In districts where the precipitation was deficient the percentage of the normal was about as follows: upper Mississippi valley, 37; Key West, Fla., and on the north Pacific coast, 42; upper lake region,

47; Missouri Valley, 60; middle-eastern slope of the Rocky Mountains, 61; west Gulf states, 69; extreme northwest, 76; northeast slope of the Rocky Mountains, 80.

The following table shows for certain stations, as reported by voluntary observers, (1) the average precipitation for August for a series of years; (2) the length of record during which the observations have been taken and from which the average has been computed; (3) the total precipitation for August, 1893; (4) the departure of the current month from the average; (5) and the extremes for August during the period of observation and the years of occurrence:

State and station.	(1) Average for the month of August.	(2) Length of record.	(3) Total for August, 1893.	(4) Departure from average.	(5) Extremes for August.			
					Greatest.		Least.	
					Am't.	Year.	Am't.	Year.
<i>Arizona.</i>	<i>Inches.</i>	<i>Years.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>		<i>Inches.</i>	
Fort Apache .....	3.84	17	3.43	- 0.41	9.33	1878	1.00	1888
Fort Mohave .....	0.64	22	T.	- 0.64	3.80	1873	0.00	1871, 1892
Whipple Barracks .....	2.91	22	4.30	+ 1.39	6.34	1878	0.24	1873
<i>Arkansas.</i>								
Keesees Ferry .....	5.41	11	3.02	- 2.39	11.53	1888	2.37	1891
<i>California.</i>								
Fort Bidwell .....	0.13	22	0.05	- 0.08	0.42	1880	0.00	†
Riverside .....	0.30	12	.....	.....	3.00	1884	0.00	*
<i>Colorado.</i>								
Las Animas .....	1.48	10	2.11	+ 0.63	3.75	1885	0.06	1889
<i>Florida.</i>								
Merritts Island .....	5.86	15	4.46	- 1.40	15.77	1880	1.15	1883
<i>Georgia.</i>								
Forsyth .....	5.11	19	13.45	+ 8.34	13.45	1893	2.50	1888
<i>Idaho.</i>								
Boise Barracks .....	0.22	19	0.00	- 0.22	1.65	1873	0.00	†
Fort Sherman .....	0.43	9	0.00	- 0.43	1.51	1892	0.00	†
<i>Indiana.</i>								
Lafayette .....	3.79	11	0.77	- 3.02	7.17	1890	0.77	1893
<i>Indian Territory.</i>								
Fort Supply .....	2.02	14	4.37	+ 2.35	5.32	1883	0.35	1874
<i>Iowa.</i>								
Cresco .....	3.11	20	1.20	- 1.91	8.34	1884	0.92	1889
<i>Kansas.</i>								
Independence .....	3.12	21	2.53	- 0.59	7.46	1885	1.33	1891
Salina .....	2.86	11	.....	.....	6.60	1887	0.30	1882
<i>Louisiana.</i>								
Grand Coteau .....	3.77	9	5.39	+ 1.62	8.07	1888	0.42	1883
<i>Maine.</i>								
Orono .....	3.78	22	3.90	+ 0.12	7.36	1885	0.53	1883
<i>Maryland.</i>								
Cumberland .....	3.11	22	3.74	+ 0.63	8.09	1882	0.31	1881
<i>Michigan.</i>								
Kalamazoo .....	2.71	17	0.75	- 1.96	8.94	1885	0.31	1889
<i>Missouri.</i>								
Sedalia .....	2.11	15	1.29	- 0.82	5.83	1888	0.29	1892
<i>Montana.</i>								
Fort Custer .....	1.10	12	0.00	- 1.10	2.55	1880	0.00	1893
<i>Nebraska.</i>								
Fort Robinson .....	1.94	10	1.46	- 0.48	3.32	1887	0.90	1886
Genoa (near) .....	2.63	17	1.46	- 1.17	5.81	1893	0.45	1881
<i>Nevada.</i>								
Browns .....	0.08	22	.....	.....	1.00	1874	0.00	*
Carson City .....	0.13	17	0.11	- 0.02	1.13	1890	0.00	*
<i>New Hampshire.</i>								
Hanover .....	3.50	22	4.85	+ 1.35	7.77	1885, 1890	0.42	1876
<i>New Mexico.</i>								
Deming .....	1.68	11	4.38	+ 2.70	4.38	1893	0.39	1892
Fort Wingate .....	2.06	22	0.60	- 1.46	5.90	1878	0.24	1888
<i>New York.</i>								
Cooperstown .....	3.62	22	7.52	+ 3.97	9.08	1885	0.63	1876
Plattsburg Barracks .....	3.24	22	5.76	+ 2.52	7.18	1892	0.37	1876
<i>North Carolina.</i>								
Lenoir .....	5.73	21	7.50	+ 1.77	10.20	1886	2.10	1877
<i>Oklahoma.</i>								
Fort Reno .....	2.99	10	10.25	+ 7.26	10.25	1893	0.34	1886
Fort Sill .....	3.17	21	4.70	+ 1.53	9.73	1888	T.	1874
<i>Oregon.</i>								
Bandon .....	0.57	14	0.01	- 0.56	2.16	1879	0.00	1888
<i>Pennsylvania.</i>								
Dyberry .....	4.32	21	4.45	+ 0.13	8.77	1885	0.95	1883
Grampian .....	4.44	16	3.26	- 1.18	8.19	1888	1.66	1883
Wellaboro .....	5.11	14	4.59	- 0.52	15.25	1885	0.83	1889
<i>South Carolina.</i>								
Statesburg .....	4.45	12	14.29	+ 9.84	14.29	1893	1.38	1892
<i>South Dakota.</i>								
Fort Sully .....	1.92	22	0.55	- 1.37	5.26	1880	0.20	1882
<i>Texas.</i>								
Austin .....	2.13	21	2.10	- 0.03	6.45	1892	T.	1877
Silver Falls .....	2.10	7	3.63	+ 1.53	4.29	1888	0.00	1889

## Departures from average precipitation—Continued.

State and station.	(1) Average for the month of August.	(2) Length of record.	(3) Total for August, 1893.	(4) Departure from average.	(5) Extremes for August.			
					Greatest.		Least.	
					Am't.	Year.	Am't.	Year.
Utah.	Inches.	Years	Inches.	Inches.	Inches.		Inches.	*
Terrace .....	0.16	21	0.00	- 0.16	1.21	1878	0.00	
Vermont.								
Strafford .....	3.76	20	5.78	+ 2.02	8.85	1890	1.40	1882
Virginia.								
Dale Enterprise .....	4.26	13	5.06	+ 0.80	10.50	1882	1.26	1890
Washington.								
Fort Townsend .....	1.74	19	0.16	- 1.58	2.52	1891	0.00	1885
West Virginia.								
Parkersburg .....	3.96	8	3.12	- 0.84	6.71	1888	0.88	1887
Wisconsin.								
Embarrass .....	4.94	32	.....	.....	7.85	1881	0.40	1873
Madison .....	2.44	22	1.42	- 1.02	6.83	1882	0.56	1881
Wyoming.								
Fort Washakie .....	0.54	11	1.05	+ 0.51	2.06	1888	T.	1886

\*Generally.

†Frequently.

## PRECIPITATION, JANUARY TO AUGUST.

For the period January to August, 1893, inclusive, the total precipitation averaged about normal in the middle and south Atlantic states, New England, the Ohio Valley and Tennessee, the Lake region, the upper Mississippi and Missouri valleys, and the extreme northwest. Over the plateau regions and on the north and south Pacific coasts the precipitation was one-tenth to three-tenths greater than usual. In the Gulf States, at Key West, Fla., on the eastern slope of the Rocky Mountains, and on the middle Pacific coast six-tenths to nine-tenths of the usual amount of precipitation was reported for the period named.

## YEARS OF GREATEST PRECIPITATION FOR AUGUST.

The precipitation for the current month was the greatest ever reported for August at Oswego, N. Y. (23 years); Forsyth, Ga. (19 years); Deming, N. Mex. (11 years); Statesburg, S. C. (12 years). The greatest precipitation for August on the north Pacific coast occurred in 1889; for the middle and lower Mississippi valleys in 1888, for the northern plateau region in 1887, in the upper Mississippi valley in 1885, on the east Gulf coast and in northern Florida in 1881, on the middle Pacific coast in 1879, and in Maine in 1877.

## YEARS OF LEAST PRECIPITATION FOR AUGUST.

The precipitation for the current month was the least ever reported for August at Chicago, Ill. (23 years); Springfield, Ill. (15 years); La Crosse, Wis. (21 years); Boise Barracks, Idaho (20 years); Fort Sherman, Idaho (9 years); Lafayette, Ind. (11 years); Fort Custer, Mont. (12 years); Terrace, Utah (21 years). The least precipitation for August over the east part of the middle and southern plateau regions was noted in 1889, over the northern plateau region in 1888, on the north Pacific coast in 1885, along the Massachusetts and Maine coasts in 1883, in the extreme northwest in 1882, from the upper Ohio valley over Virginia and North Carolina in 1881, and in New York and western New England in 1876.

## EXCESSIVE PRECIPITATION.

The following tables show, by states, the number of stations reporting monthly precipitation to equal or exceed 10.00; precipitation to equal or exceed 2.50 in 24 hours; and precipitation to equal or exceed 1.00 in 1 hour in August, 1893:

## Monthly precipitation to equal or exceed 10.00.

State.	Number of stations.	State.	Number of stations.
South Carolina.....	34	Georgia.....	9
North Carolina.....	10	Florida.....	4

## Monthly precipitation to equal or exceed 10.00—Continued.

State.	Number of stations.	State.	Number of stations.
New York.....	3	Louisiana.....	1
Alabama.....	2	Mississippi.....	1
New Jersey.....	2	Tennessee.....	1
Oklahoma.....	2		

## Precipitation to equal or exceed 2.50 in 24 hours.

State.	Number of stations.	Dates.	State.	Number of stations.	Dates.
South Carolina...	41	1, 2, 2-3, 3-4, 4-5, 5, 6, 10-11, 13-14, 18, 22, 23, 23-24, 26-27, 27-28, 28, 28-29, 29, 29-30, 29-31, 30, 30-31, 31	Louisiana.....	8	1, 3, 4-5, 10, 11-12, 13-14, 14
New Jersey.....	38	12, 12-13, 19-20, 20, 23-24	Connecticut.....	7	4-5, 23-24, 24-25
New York.....	34	5, 6, 19-20, 23, 23-24, 24, 28-29, 29	Iowa.....	7	11, 14-15, 15
North Carolina...	31	1, 1-2, 13-14, 14, 27-28, 28, 30-31	Kansas.....	6	9, 14, 14-15, 15, 19-20
Pennsylvania.....	33	19, 19-20, 20, 23-24, 24, 28-29, 29	Mississippi.....	6	2, 5, 6, 12, 12-13, 13-14
Massachusetts...	20	4-5, 6, 7, 6-7, 20-21, 24	West Virginia...	6	28, 28-29
Georgia.....	18	1, 4, 5-6, 6, 18, 27, 28, 30-31, 31	Arkansas.....	5	10-11, 11, 11-12, 12, 24
Florida.....	13	2, 2-3, 5, 9, 19, 30-31, 22, 26-27, 27	Ohio.....	5	3-4, 20, 28-29, 29
Nebraska.....	13	14-15, 15	Texas.....	5	4-5, 7, 9, 15
Virginia.....	12	3-4, 4, 4-5, 28, 28-29, 31	Maryland.....	4	12, 28, 28-29
Minnesota.....	11	9, 9-10, 23-24, 24	Tennessee.....	4	3-4, 17
Missouri.....	10	11, 14-15, 15-16, 24	Colorado.....	2	1
Alabama.....	8	5, 10, 10-11, 11, 13, 13-14	Indian Territory	2	2, 3
			Oklahoma.....	2	8, 10
			Vermont.....	2	7
			Wisconsin.....	2	4, 9
			Arizona.....	1	13
			Illinois.....	1	5
			Maine.....	1	21
			New Hampshire...	1	27
			New Mexico.....	1	16
			North Dakota...	1	9

## Precipitation to equal or exceed 1.00 in 1 hour.

Louisiana.....	13	1, 3, 4, 7, 10, 11, 13, 14, 15, 23	Colorado.....	3	18, 30
Kansas.....	12	8, 9, 10, 16, 17, 19, 20, 27, 29	Iowa.....	3	5, 8, 23
Alabama.....	11	2, 3, 5, 6, 7, 10, 11, 12, 23, 31	Massachusetts...	3	6, 21, 27
Florida.....	11	1, 4, 5, 9, 11, 15, 16, 19, 20, 21, 22, 31	Missouri.....	3	5, 25
Mississippi.....	10	2-6, 9, 12, 13, 17	New York.....	3	6, 19, 27
South Carolina...	10	4, 6, 10, 13, 14, 18, 23, 27, 29	Tennessee.....	3	3, 17, 26
Georgia.....	9	1, 2, 3, 6, 13, 27, 30	Texas.....	3	4, 20
Nebraska.....	7	5, 10, 14, 15, 19, 26	Wisconsin.....	1	4, 18, 22
Arizona.....	5	5, 13, 14	Arkansas.....	2	25
Minnesota.....	5	15, 19, 23, 26	Maryland.....	2	12, 20
New Jersey.....	5	19	New Hampshire...	2	7
Oklahoma.....	4	8-10, 12	New Mexico.....	2	16, 19
			North Carolina...	2	12, 30
			Ohio.....	2	3, 20
			Virginia.....	2	17, 20
			Illinois.....	1	5
			Pennsylvania....	1	20

## Table of excessive precipitation, August, 1893.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Alabama.						
Claiborne Landing	Inches.	Inches.		Inches	h. m.	
Demopolis		2.91	10-11	1.40	1 00	7
Elba		3.70	10	2.70	2 00	11
Eufaula a.		3.80	13-14	3.70	3 00	10
Eufaula c.		3.91	13			
Greensboro		2.94	13-14	1.40	1 00	5
Highland Home				1.82	1 45	12
Livingston b.		3.33	13-14			
Newbern				1.87	1 30	31
Newburg				1.08	1 00	23
Newton		4.05	11	4.05	2 00	11
Rock Mills		3.06	13			
Sturdevant		3.06	5	1.33	0 30	3
Tallassee Falls				1.52	1 30	6
Tuscaloosa				1.44	0 45	2
Union Springs a.	10.51					
Union Springs b.	11.24					
Arizona.						
Crittenden				1.58	1 10	13
Farleys Camp		2.70	13			
Fort Huachuca				1.40	0 30	14
Holbrook				1.40	0 45	13
Natural Bridge				1.05	1 00	5
Tucson (W. B.)				1.30	1 15	5



Table of excessive precipitation—Continued.

State and station.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<b>Arkansas.</b>						
Arkansas City.....	Inches.	Inches.	11-12	Inches	h. m.	
Brinkley.....		4.40	24			
Gaines Landing.....		2.60	12			
Hamburg.....		3.50	24			
Hot Springs.....		5.81	12	2.00	1 15	25
Winslow.....				1.00	1 00	25
<b>Colorado.</b>						
Byers.....		4.45	10-11			
Cheyenne Wells.....				2.00	2 00	30
River Bend.....				1.00	1 02	30
Rocky Ford.....				1.00	0 30	18
Springfield.....		3.05	1			
<b>Connecticut.</b>						
Canton.....		2.60	1			
Falls Village.....		2.68	24			
Greenfield Hill.....		2.74	23-24			
Do.....		2.81	4-5			
New Hartford b.....		2.82	23-24			
Norwalk.....		3.03	24			
Stevenson.....		2.88	23-24			
Waterbury.....		3.39	24-25			
<b>Florida.</b>						
Amelia.....	10.50	3.30	23-24			
Bristol.....		4.80	27			
Brooksville.....				1.10	1 00	31
Federal Point.....				1.40	0 20	1
Gainesville.....		3.15	27	2.12	1 30	9
Green Cove Springs.....		3.72	19	3.72	1 20	19
Homeland.....	10.42	2.60	27			
Do.....		2.72	5	2.72	2 00	5
Jacksonville.....	10.02	1.76		1.76	1 30	16
Jupiter.....		3.62	27	1.11	1 00	1
Do.....		4.47	20-21	2.35	0 30	20
Kissimmee.....				2.12	0 20	21
Pensacola.....		2.60	2			
Plant City.....	11.10	2.70	2-3			
Do.....				1.01	1 00	11
Saint Francis Barracks.....		2.92	22	2.92	1 00	22
Saint Petersburg.....		4.20	26-27			
Do.....		3.84	9	1.30	1 15	4
Tallahassee.....				1.20	1 00	20
Tampa.....				2.20	1 30	15
<b>Georgia.</b>						
Americus.....		2.61	9			
Augusta.....				1.50	1 00	2
Brag.....	13.41	4.17	27-28			
Cordele.....		4.78	27-28			
Darien.....	17.31	1.06		1.06	1 00	6
Do.....		2.50	5-6			
Dublin.....	10.61	5.67	27-28			
Forsyth.....	13.45					
Hephzibah.....		4.25	30-31			
Homerville.....		3.40	27-28	1.73	1 10	30
Louisville.....		2.97	18			
Lumpkin.....	10.28	3.97	31	1.17	0 45	1
McArthur.....	10.36 <sup>h</sup>	3.11	31			
Milledgeville.....	10.46			2.15	1 50	30
Monticello.....		2.55	6			
Morgan.....		3.55	4			
Newnan.....		2.65	1			
Quitman.....		2.56	1			
Resaca.....		3.30	30-31	2.30	0 40	30
Rome.....				1.31	1 05	13
Savannah.....	12.59	1.93		1.93	1 00	3
Talbotton.....		5.61	27-28	1.24	1 00	27
Waynesboro.....		3.09	4			
West Point.....	10.71	3.18	27-28			
Whitesburg.....		10.71				
<b>Illinois.</b>						
Bushnell.....		2.55	†			
<b>Indian Territory.</b>						
Lehigh.....		4.02	5	4.02	1 00	5
Purcell.....		2.90	3			
<b>Iowa.</b>						
Centerville.....		3.67	2			
Clarinda.....		2.50	15			
College Springs.....		5.60	14-15			
Corning.....		3.10	15			
Do.....		3.41	11			
Mechanicsville.....		2.75	14-15			
Murray.....				1.35	1 00	5
Sioux City.....		3.65	14-15	1.58	1 00	8
Villisca.....				2.08	1 00	23
<b>Kansas.</b>						
Cawker City.....		2.55	16			
Fort Riley.....				2.00	3 00	20
Gibson.....		4.00	15			
Horton.....		2.61	14-15			
Independence.....		3.19	14-15			
Liberal.....				1.22	0 55	27
Marion.....				1.74	1 00	19
Morton.....				1.72	1 20	27
Pleasant Dale.....		2.50	19-20			
Sedan.....				1.36	1 00	20
Sharon Springs.....				1.11	0 45	19
Syracuse.....		3.00	9	3.00	1 45	9
Tribune.....				2.02	0 40	17
Wakefield.....				1.05	0 30	29
Wallace b.....				2.05	1 07	16
Wamego.....				1.30	0 45	8
				1.66	1 15	10

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Kansas—Continued.		Inches.		Inches.	A. m.	
Washington	Louisiana.	3.40	14			
Alexandria				1.35	0 40	13
Cheneyville		2.92	13-14	1.12	1 00	11
Clinton		3.34	3	3.34	1 30	3
Emilie				1.00	1 00	7
Do.				1.62	0 30	7
Franklin				1.15	1 00	4
Hamburg		4.04	14	4.04	4 00	14
Lake Charles	11.25	4.00	1			
Lawrence		2.75	1			
Do.		3.85	10	3.85	2 45	10
New Iberia		3.65	11-12			
Oxford				1.10	0 35	15
Plaquemine				1.65	1 00	1
Shell Beach		3.67	4-5			
Wallace				1.01	1 00	10
Do.				1.25	0 30	23
Winnshoro				2.00	2 00	4
Maine.						
Eastport	Maryland.	2.51	21			
Boettcherville		3.00	28-29			
Cumberland a		2.60	28-29			
Cumberland b		2.65	28			
Fallston		2.85	12	2.85	2 31	12
Fenby		3.40	28-29			
Solomons				1.47	1 10	20
Massachusetts.						
Bedford		2.50	7			
Blue Hill (summit)		3.03	4-5			
Boston (W. B.)				1.07	0 52	6
Concord		2.54	7			
Fall River a		3.00	20-21			
Fitchburg a				1.91	1 34	27
Fitchburg b		2.99	27	2.99	1 45	27
Hyannis		3.40	20-21			
Lynn a		3.13	6			
Mansfield		2.75	4-5			
Milton		3.24	4-5	2.18	2 00	21
Monroe		3.09	24			
Nantucket		2.86	20-21			
New Bedford b		2.74	20-21			
Plymouth		4.14	20-21			
Provincetown		2.59	21			
Roxbury		2.58	4-5			
Salem		2.87	6-7			
Somerset		2.82	20-21			
South Dennis		3.76	20-21			
Taunton b		3.15	4-5			
Do.		2.53	20-21			
Taunton c		2.60	4-5			
Do.		3.78	20-21			
Taunton d		3.15	4-5			
Woods Holl		4.45	20-21			
Minnesota.						
Alexandria a		3.20	9-10			
Carver		2.56	24			
Collegeville				1.12	0 30	26
Fort Ripley		2.65	9			
Lake Winnibigoshish		3.40	9			
Leech Lake		2.83	9-10			
Long Prairie		3.51	9-10			
Maple Plain				1.35	1 10	23
Minneapolis (W. B.)		4.08	23-24			
Minneapolis a		3.88	23-24			
Minnesota City				2.36	2 00	15
Montevideo				1.95	0 30	19
Morris		3.10	9-10			
Pokegama Falls		2.62	9-10			
Saint Oloff		2.50	9			
Saint Paul				1.10	1 00	23
Wadena		4.75	9			
Mississippi.						
Duck Hill				1.05	1 00	9
Edwards		4.53	6	4.00	2 00	6
Fayette				1.43	0 30	2
Do.				1.37	1 00	3
Do.				1.27	1 00	6
Hattiesburg		3.50	5			
Hazlehurst		3.22	12-13	1.50	1 00	12
Do.				1.72	1 30	13
Lake		2.90	13-14			
Macon				1.34	1 05	12
Meridian				1.09	1 00	12
Moss Point	15.75	3.00	2			
Do.		2.60	12			
Palo Alto				1.15	1 00	17
Thornton		3.14	12	1.42	1 00	5
Valden				1.38	1 00	2
Woodville				2.14	1 45	4
Missouri.						
Big Piney		2.80	24			
Conception		2.50	15-16			
Fairport		3.50	15-16			
Fox Creek				1.15	0 20	25
Gallatin		2.95	15-16			
Ironton				1.54	1 00	25
Oregon a		4.60	14-15			
Oregon b		3.36	14-15			

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Missouri—Continued.						
Oto	Inches.	Inches.		Inches.	h. m.	
Pickering		2.75	11			
Rea		4.93	14-15			
Saint Joseph		5.00	14-15			
Sublette		2.77	15-16			
Unionville				1.60	1 00	
Nebraska.						
Arberville		3.43	15-16			
Ashland				1.06	0 45	
Beatrice		5.21	14-15			
Crete		5.22	14-15			
Fairbury		2.55	15			
Geneva		3.00	14-15			
Lincoln		3.30	14-15			
Omaha		4.06	14-15			
State Farm				1.00	0 35	
Sutton		5.01	14-15			
Do.				1.40	0 35	
Syracuse				1.30	1 06	
Table Rock		4.35	14-15			
Do.		5.81	14-15	1.40	1 00	
Tecumseh				1.81	1 30	
Turlington		4.23	14-15			
Do.		4.90	14-15	2.92	0 50	
Weeping Water				1.50	0 35	
West Point		3.74	14-15			
York				1.30	1 00	
New Hampshire.						
Grafton		2.85	15			
Keene						
New Jersey.						
Asbury Park		3.15	27	2.35	1 50	
Bayonne		3.15		1.40	1 00	
Belvidere	11-94	3.75	23-24			
Beverly		2.80	19-20			
Boonton		7.39	19-20			
Camden		3.03	23-24			
Charlotteburg		2.50	23			
Chester		2.93	23-24			
Deckertown		3.54	23-24			
Dover		3.95	23-24			
Egg Harbor City		5.17	23-24			
Elizabeth		2.92	19-20			
Franklin Furnace		3.35	23-24			
Do.		2.86	19-20			
Franklinville		2.65	19-20	0.99	0 15	
Freehold		3.61	24			
Gillette		2.89	23-24			
Do.		3.53	23-24			
Highland Park		2.90	20			
Do.		3.72	23-24			
Hightstown		2.81	12	1.95	0 50	
Locktown		2.60	23-24			
Do.		3.08	23-24			
Millville		2.90	20			
Moorestown		3.38	23-24			
Newark a.		2.71	23-24			
Newark b.		3.05	23-24			
Do.		3.38	19-20			
New Brunswick (W. B.)		3.91	19-20			
Do.		2.50	23-24			
Do.		2.82	12-13			
Do.		3.60	19-20	1.95	0 50	
New Brunswick a.		2.61	23-24			
Do.	10.70	2.96	12	1.59	0 47	
Do.		3.86	19-20			
New Brunswick b.		3.00	23-24			
Newton		2.96	23-24			
Ocean City		3.40	23-24			
Oceanic		3.40	23-24			
Pateron		3.31	23-24			
Pensauken		4.23	23-24			
Plainfield		2.62	23-24			
Somerville		3.63	23-24			
Do.		3.91	19-20	2.00	0 30	
South Orange		3.08	23-24			
Do.		2.61	19-20			
Tenafly		3.71	23-24			
Toms River		4.20	23-24			
Trenton		2.88	23-24			
Vineland		2.76	23-24			
Woodbine		3.40	23-24			
New Mexico.						
East Las Vegas		3.86	23-24			
Santa Fe		3.10	16	2.47	1 00	16
New York.						
Albany				1.98	1 42	19
Alfred Center		2.62	24			
Arcade		2.50	29			
Bovina Center		3.55	28-29			
Buffalo		10.56				
Constableville		4.25	28-29			
Dunkirk		2.84	29			
Easton		4.21	29			
Eden Center		12.48				
Fort Niagara		4.56	28-29			
Hess Road Station		3.30	28-29			
Honeymead Brook		3.46	28-29			
Humphrey		2.89	24			
Kings Station		3.82	23-24			
Lebanon Springs		11.25				
		3.00	24			

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall to inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
New York—Continued.		Inches.	Inches.	Inches	h. m.	
Leroy		2.80	29			
Lockport		3.82	28-29			
Lowville		4.38	29			
Lyons		3.50	28			
Madison Barracks		5.25	28-29			
Malone		2.88	24			
Middletown		3.04	23-24			
Mount Morris		2.95	29			
New Lisbon				1.26	1 00	27
New York City		3.83	23-24	1.60	1 00	19
North Hammond		4.40	29			
Ogdensburg		3.75	28-29			
Oswego		3.70	28-29			
Potsdam		2.94	5-6	2.04	0 50	6
Do.		3.10	29			
Poughkeepsie		4.00	24			
Rochester		4.19	28-29			
Setauket		2.58	19-20			
Turin		2.52	28-29			
Varysburg		4.05	29			
Wappingers Falls		3.23	24			
Watertown		3.28	29			
West Point		3.17	23-24			
Willets Point		3.45	23			
North Carolina.						
Bailey	10.68	4.60	28			
Bakersville		2.90	13-14			
Blowing Rock		4.93	28			
Chapel Hill		3.53	27-28			
Charlotte		4.64	27-28			
Columbus	14.39	3.40	14			
Do.		5.75	28			
Douglas	11.20	2.60	27-28			
Experimental Farm				1.01	0 55	12
Flat Rock	10.15	3.55	14			
Do.		3.73	28			
Greensboro	10.75	4.06	28			
Hatteras		2.78	28			
Highlands	12.35	5.34	13-14			
Do.		4.11	30-31			
Horse Cove		3.83	30-31	2.00	1 00	30
Lenoir		4.00	28			
Lynn		2.64	14			
Do.		3.41	27-28			
Marion		4.75	27-28			
Mocksville	11.22	2.67	28			
Morganton		4.50	27-28			
Mount Airy		2.61	31			
Mount Holly		2.51	27-28			
Do.		2.80	31			
Mount Pleasant		3.58	27-28			
Oak Ridge		3.86	27-28			
Raleigh		2.78	28			
Rockingham	10.16	3.20	28			
Roxboro		3.90	28			
Salisbury		4.45	28			
Saxon	10.87	2.68	1			
Do.		3.33	28			
Do.		2.72	31			
Shelby		3.75	27-28			
Sloan	11.79	4.47	1-2			
Smithfield		2.58	28			
Soapstone Mount		3.66	28			
Southern Pines		3.10	28			
North Dakota.						
Forman		2.74	9			
Ohio.						
Annapolis		2.76	29			
Bement		2.84	20			
Hanging Rock				2.00	2 00	26
Jacksonville				1.15	0 30	3
Lowell		2.55	28-29			
New Alexandria		3.87	29			
Springboro		4.40	3-4			
Oklahoma.						
Anadarko				2.00	2 00	10
Buffalo	12.55	4.00	8	4.00	2 30	8
Do.				2.10	2 00	12
Fort Reno	10.25			1.00	0 30	9
Sac and Fox Agency		4.02	10			
Pennsylvania.						
Beaver Dam		2.51	29			
Blooming Grove		3.11	23-24			
Blue Knob		3.15	29			
Carlisle		2.09	29			
Clarion		2.87	28-29			
Doylestown		2.98	20			
Do.		3.28	24			
Forks of Neshaminy		3.26	24			
Freeport		2.64	28-29			
Gettysburg		2.54	28-29			
Hamburg		3.40	19			
Huntingdon		3.63	28-29			
Kilmer		4.00	28-29			
Mahoning		2.62	29			
Meadville		3.04	28-29			
Ottaville		3.12	20			
Parker		3.79	28-29			
Point Pleasant		3.36	20			
Do.		3.71	24			



Table of excessive precipitation—Continued.

State and station.	Monthly rainfall in inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
Pennsylvania—Continued.						
Pottstown	Inches.	Inches.		Inches	h. m.	
Quakertown	4.75	19-20		1.35	1 15	20
Do.	2.59	23-24				
Seisholtzville	2.79	20				
Smethport	2.50	28-29				
Smiths Corners	3.23	20				
Uniontown	2.63	28-29				
Warren	3.18	28-29				
South Carolina.						
Allendale	12.71	3.20	27-28	2.00	1 30	27
Batesburg	13.06	5.70	27-28			
Blacksburg	11.57	3.36	26			
Do.	5.93	27-28				
Blackville	10.09	6.86	27-28			
Brewer Mine	13.99	5.20	28			
Do.		2.52	30			
Camden		4.07	27-28			
Charleston	15.53	3.80	27-28	1.26	0 39	14
Cheraw a	14.41	2.74	4-5			
Do.		4.44	23			
Do.		2.98	28-29			
Cheraw b	16.69	5.06	23-24	4.46	4 00	23
Do.		4.44	27-28			
Columbia		4.60	27-28			
Connors	22.26	12.40	27-28			
Do.		5.03	29-31			
Cross Hill		4.38	27-28			
Davis Bridge	16.53	3.74		3.74	2 00	6
Do.		7.02	27-28			
Effingham	15.44	6.45	27-28			
Flint Hill		4.70	27-28			
Florence	14.17	3.54	27-28			
Do.		2.75	29-30			
Georgetown	18.45	4.05	27			
Do.		2.50	29			
Hampton	14.50	5.95	27-28			
Hardeeville	24.67	5.50	2-4	2.35	1 30	4
Do.		3.83	10-11	3.23	2 15	10
Do.		6.40	27-28	1.75	1 00	13
Kingsree	11.26	4.00	27-28			
Kitchings Mills	14.55	3.44	18			
Do.		4.15	27-28			
Do.		4.00	30-31			
Longshore	11.99	4.69	27-28			
Manning	17.61	13.22	27-28			
Martins	12.23	3.12	5			
Do.		5.20	27-28			
Nichols		3.61	27-28			
Pinopolis	18.88	4.15	14			
Do.		6.00	27-28			
Port Royal	13.71	2.57	1			
Saint Georges	20.45*	10.15*	26-27			
Do.		2.97	30-31			
Saint Matthews	12.48	4.37	27-28	1.44	0 45	18
Saint Stephens	24.24	3.62	13-14			
Do.		8.28	27-28			
Do.		4.10	30			
Selalia	11.48	4.70	28			
Simpsonville		2.83	28			
Society Hill	12.20	2.90	22			
Do.		3.41	27-28			
Spartanburg	10.77	4.82	14			
Statesburg	14.29	6.74	27-28	1.49	1 10	6
Tillers Ferry a	14.61	5.33	2-3	1.41	1 18	29
Do.		3.80	27-28			
Tillers Ferry b	12.45	2.97	2			
Do.		5.59	27-28			
Trenton	13.20	6.07	27-28	1.42	0 20	18
Trial	15.35	4.26	13-14	2.20	1 00	14
Do.		6.96	27-28			
Waterloo	18.87	3.03	14			
Do.		8.45	27-28			
Watts		2.66	14			
Yorkville		5.68	27-28			
Youngs Island	16.85*	3.05	5			
Tennessee.						
Ashwood		2.75	17			
Clarksville				1.05	0 30	26
Greenville		2.94	3-4			
Tullahoma				1.00	0 45	17
Riddleton	11.17	8.35	3	8.35	5 00	3
Wier		4.00	3			
Texas.						
Eastland		2.70	4			
Forestburg		2.78	7			
Laredo		6.38	9			
McGregor				1.26	1 00	4
Orange		2.93	15			
Silver Falls				1.82	0 35	20
Stella		2.75	4-5	2.05	0 35	4
Vermont.						
Burlington		2.50	7			
Wells		3.04	7			
Virginia.						
Bedford City		2.92	28			
Birdsneat				1.40	1 05	17
Buchanan		5.10	28			
Christiansburg		4.06	28			
Do.		2.69	31			
Columbia		2.50	4			

Table of excessive precipitation—Continued.

State and station.	Monthly rainfall in inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>Virginia—Continued.</i>		<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>h. m.</i>	
Colonbia.....			3.54	28		
Dale Enterprise.....			4.22	28		
Lexington.....			2.93	28		
Lynchburg.....			2.51	3-4		
Do.....			2.89	28-29		
Norfolk.....					1.28	1 00
Nottoway.....			4.03	4-5		20
Petersburg.....			2.90	4		
Riverton.....			2.80	28-29		
Stanardsville.....			4.13	28		
Wytheville.....			4.30	28		
<i>West Virginia.</i>						
Bluefield.....			3.95	28		
Elkhorn.....			2.72	28		
New Cumberland.....			3.38	28		
Parkersburg (W. B.).....			3.22	28		
Pleasant Hill.....			2.56	28-29		
Wheeling a.....			3.30	28-29		
Wheeling b.....			3.55	28		
<i>Wisconsin.</i>						
Ashland.....			2.99	9		
Estella.....					2.07	1 00
Do.....					2.00	2 00
Neillsville.....					1.35	0 45
Sparta.....			3.27	4		

Received too late for publication in July, 1893.

<i>Alabama.</i>						
Newbern				1.80	1 30	30
Uniontown	3.91	28				
<i>Kansas.</i>						
Elk City				1.37	1 00	8
<i>South Carolina.</i>						
Manning				1.02	0 50	20
<i>Tennessee.</i>						
Covington b				1.39	1 50	9

\* Estimated, gauge blown down. † July 31.

## MAXIMUM RAINFALL IN ONE HOUR OR LESS.

The following table is a record of the heaviest rainfall during August, 1893, for periods of five and ten minutes and one hour, as reported by regular stations of the Weather Bureau furnished with self-registering gauges:

Station.	Maximum fall in—					
	5 min.	Date.	10 min.	Date.	1 hour.	Date.
	Inch.		Inch.		Inch.	
Atlanta, Ga.	0.20	30	0.35	2, 30	0.71	30
Baltimore, Md.	0.25	29	0.40	29	0.50	29
Bismarck, N. Dak.	0.02	22	0.03	22	0.12	22
Boston, Mass.	0.37	6	0.70	6	1.07	6
Buffalo, N. Y.	0.30	28	0.40	28	0.60	28
Cincinnati, Ohio	0.06	28	0.10	28	0.20	28
Chicago, Ill.					0.06	16
Cleveland, Ohio	0.12	12	0.17	12	0.33	28
Denver, Colo.	0.05	21	0.10	21	0.24	21
Detroit, Mich.	0.13	11	0.23	11	0.38	11
Dodge City, Kans.	0.21	19	0.39	19	0.82	19
Duluth, Minn.	0.06	9	0.08	10	0.25	10
Eastport, Me.	0.07	21	0.13	21	0.64	31
Galveston, Tex.	0.29	25	0.48	25	0.95	13
Indianapolis, Ind.	0.10	16	0.12	16	0.19	16
Jacksonville, Fla.	0.25	6, 9	0.45	1	1.11	1
Jupiter, Fla.	0.50	21	0.95	21	2.35	30
Kansas City, Mo.	0.10	11	0.12	11, 27	0.25	27
Key West, Fla.	0.21	31	0.34	31	0.45	31
Marquette, Mich.	0.13	24	0.18	24	0.35	24
Memphis, Tenn.	0.14	14	0.23	14	0.25	14
Milwaukee, Wis.	0.08	11	0.12	11	0.20	24
New Orleans, La.	0.19	1	0.25	1	0.65	1
New York, N. Y.	0.35	19	0.50	19	1.60	19
Norfolk, Va.	0.32	28	0.45	20	0.99	30
Omaha, Nebr.	0.50	14	0.80	14	1.00	14
Philadelphia, Pa.	0.04	24	0.07	24	0.25	24
Pittsburg, Pa.						
Portland, Me.	0.10	29	0.15	29	0.31	29
Portland, Oregon*						
Saint Louis, Mo.	0.02	11	0.04	11	0.10	11
Saint Paul, Minn.	0.50	23	0.70	23	1.10	23
Salt Lake City, Utah	0.12	13	0.20	13	0.22	13
San Diego, Cal.						
San Francisco, Cal.*						
Savannah, Ga.†	0.37	20	0.55	14	1.24	27
Tampa, Fla.†	0.20	29	0.35	29	0.55	29
Washington, D. C.	0.17	28	0.25	28	0.92	28
Wilmington, N. C.	0.25	4	0.45	6	0.78	6, 30

\* Less than 0.05 in 1 hour. † Self-register out of order. ‡ Record incomplete.

The following tables show the number of years for which monthly precipitation to equal or exceed 10.00 inches, daily precipitation to equal or exceed 2.50 inches, and hourly precipitation to equal or exceed 1.00 inch has been reported in the several states and territories for August during the last 24 years:

*Excessive monthly precipitation.*

State.	No. years noted.	State.	No. years noted.
Florida.....	20	Wisconsin.....	3
North Carolina.....	18	Kentucky.....	3
Georgia.....	17	Mississippi.....	3
South Carolina.....	17	Arkansas.....	3
Alabama.....	17	Delaware.....	3
New York.....	16	Maine.....	3
Virginia.....	16	West Virginia.....	3
Texas.....	15	Arizona.....	1
Louisiana.....	15	Colorado.....	1
Kansas.....	15	The Dakotas.....	1
New Hampshire.....	15	District of Columbia.....	1
New Jersey.....	15	Minnesota.....	1
Illinois.....	15	New Mexico.....	1
Indiana.....	15	Vermont.....	1
Iowa.....	15	California.....	1
Massachusetts.....	15	Indian Territory.....	1
Connecticut.....	15	Idaho.....	1
Ohio.....	15	Montana.....	1
Pennsylvania.....	15	Nevada.....	1
Missouri.....	15	Oregon.....	1
Tennessee.....	15	Rhode Island.....	1
Maryland.....	15	Utah.....	1
Michigan.....	15	Washington.....	1
Nebraska.....	15	Wyoming.....	1

*Excessive daily precipitation (24 hours).*

State.	No. years noted.	State.	No. years noted.
Georgia.....	22	New Jersey.....	12
Texas.....	21	Nebraska.....	11
Florida.....	20	Indiana.....	10
North Carolina.....	20	Maryland.....	9
South Carolina.....	19	New Hampshire.....	9
Pennsylvania.....	19	Indian Territory.....	9
Iowa.....	18	West Virginia.....	9
Missouri.....	18	Arizona.....	9
New York.....	18	Kentucky.....	9
Tennessee.....	18	Delaware.....	9
Massachusetts.....	18	Rhode Island.....	9
Illinois.....	18	Vermont.....	9
Mississippi.....	18	Montana.....	9
Alabama.....	18	Colorado.....	9
Ohio.....	18	California.....	9
Kansas.....	18	New Mexico.....	9
Wisconsin.....	18	District of Columbia.....	9
Connecticut.....	18	Idaho.....	9
The Dakotas.....	18	Nevada.....	9
Arkansas.....	18	Oregon.....	9
Louisiana.....	18	Utah.....	9
Virginia.....	18	Washington.....	9
Michigan.....	18	Wyoming.....	9
Minnesota.....	18		

*Excessive hourly precipitation.*

State.	No. years noted.	State.	No. years noted.
Texas.....	18	New Jersey.....	9
Florida.....	16	Kentucky.....	9
Georgia.....	16	Colorado.....	9
Tennessee.....	15	Massachusetts.....	9
Pennsylvania.....	15	New Hampshire.....	9
Kansas.....	15	Wisconsin.....	9
Ohio.....	15	Connecticut.....	9
North Carolina.....	15	New Mexico.....	9
Iowa.....	15	Maine.....	9
South Carolina.....	15	Montana.....	9
Virginia.....	15	Rhode Island.....	9
Michigan.....	15	Minnesota.....	9
Nebraska.....	15	Indian Territory.....	9
The Dakotas.....	15	West Virginia.....	9
Illinois.....	15	District of Columbia.....	9
Indiana.....	15	Vermont.....	9
New York.....	15	California.....	9
Mississippi.....	15	Delaware.....	9
Maryland.....	15	Washington.....	9
Louisiana.....	15	Idaho.....	9
Arkansas.....	15	Nevada.....	9
Missouri.....	15	Oregon.....	9
Arizona.....	15	Utah.....	9
Alabama.....	15	Wyoming.....	9

The following tables give exceptionally heavy monthly, daily, and hourly precipitation reported for August during the last 24 years:

*Monthly.*

Station and state.	Am't.	Year.	Station and state.	Am't.	Year.
	Inches.			Inches.	
Fort Barrancas, Fla.....	30.73	1878	Charleston, Ill.....	23.04	1882
Asheville, N. C.....	28.65	1887	New Smyrna, Fla.....	23.00	1871
Ellsworth, N. C.....	28.33	1880	New Orleans, La.....	22.74	1888
Fort Barrancas, Fla.....	25.07	1879	Tarboro, N. C.....	22.73	1887
Hardeeville, S. C.....	24.67	1893	Saint Augustine, Fla.....	21.50	1871
Maurepas, La.....	23.44	1888	Fairview, Fla.....	21.35	1871
Newport, Fla.....	23.25	1872	Saint Georges, S. C. †.....	20.45	1893

† Estimated, gauge blown down.

*Daily (24 hours).*

Station and state.	Amount.	Date.	Station and state.	Amount.	Date.
	Inches.			Inches.	
Manning, S. C.....	13.22	27-28, 1893	Trenton, S. C.....	6.07	27-28, 1893
Connors, S. C.....	12.40	27-28, 1893	Pinopolis, S. C.....	6.00	27-28, 1893
Campo, Cal. *.....	11.50	12, 1891	Hazlehurst, Miss.....	6.00	27, 1890
Griffin, Ga.....	10.38	8, 1883	Phillips, Wis.....	6.00	8, 1890
Saint Georges, S. C. †.....	10.15	26-27, 1893	Hampton, S. C.....	5.95	27-28, 1893
Granbury, Tex.....	10.15	26, 1888	Clarksville, Tenn.....	5.90	20, 1891
Fort Barrancas, Fla.....	9.75	29, 1878	Hamburg, S. C.....	5.81	12, 1893
Hatteras, N. C.....	9.14	23, 1880	Table Rock, Nebr.....	5.81	14-15, 1893
Tecumseh, Nebr.....	9.00	12, 1889	Columbia, S. C.....	5.75	28, 1890
Ellsworth, N. C.....	9.00	4, 1880	Batesburg, S. C.....	5.70	27-28, 1893
New Orleans, La.....	8.90	20, 1888	Yorkville, S. C.....	5.68	27-28, 1893
Mandeville, La.....	8.54	8, 1888	Darien, Ga.....	5.67	27-28, 1893
Cape May, N. J.....	8.46	18, 1879	Savannah, Ga.....	5.61	27-28, 1893
Wateree, S. C.....	8.45	27-28, 1893	Clarinda, Iowa.....	5.60	14-15, 1893
Riddleton, Tenn.....	8.35	3, 1893	Tillers Ferry, S. C. b.....	5.59	27-28, 1893
Stephens, S. C.....	8.28	27-28, 1893	Birdsneet, Va.....	5.55	21-22, 1892
Kittyhawk, N. C.....	8.14	15, 1883	Camp Eagle Pass, Tex.....	5.50	2, 1891
Vesper, Kans.....	8.10	19, 1890	Sugar Ex. Station, La.....	5.48	15, 1892
Grantsburg, Wis.....	7.75	19-20, 1889	Washington, Ga.....	5.40	26, 1891
Johnstown, Va.....	7.70	18, 1879	Highlands, N. C.....	5.34	13-14, 1893
Marshall, Mo.....	7.48	18-19, 1891	Tillers Ferry, S. C. a.....	5.33	2-3, 1893
Belvidere, N. J.....	7.39	19-20, 1893	Madison B'ks, N. Y.....	5.25	26-29, 1893
Davis Bridge, S. C.....	7.02	27-28, 1893	Beatrice, Nebr.....	5.22	14-15, 1893
Central City, Ky.....	7.02	22, 1891	Ashland, Nebr.....	5.21	14-15, 1893
Tril, S. C.....	6.96	27-28, 1893	Brewer Mine, S. C.....	5.20	28, 1893
Blackville, S. C.....	6.86	27-28, 1893	Martins, S. C.....	5.20	27-28, 1893
Statesburg, S. C.....	6.74	27-28, 1893	Deckertown, N. J.....	5.17	23-24, 1893
Union Point, Ga.....	6.60	26-27, 1891	Fort Smith, Ark.....	5.10	19-20, 1890
Carson, Iowa.....	6.50	9, 1889	Buckhannon, W. Va.....	5.10	28, 1893
Edgingham, S. C.....	6.45	27-28, 1893	Cheraw, S. C.....	5.06	23-24, 1891
Hardeeville, S. C.....	6.40	27-28, 1893	Lillington, N. C.....	5.02	22-23, 1891
North Hammond, N. Y.....	6.40	26, 1892	Thomasville, Ga.....	5.02	15-16, 1892
Laredo, Tex.....	6.38	9, 1893	State Farm, Nebr.....	5.01	14-15, 1893
Chicago, Ill.....	6.33	2-3, 1885	Rea, Mo.....	5.00	14-15, 1893

\* Cloudburst; rainfall not all measured.

† Estimated, gauge blown down.

*One hour and less.*

Station and state.	Amount.	Time.	Date.
	Inches.	A. M.	
Jupiter, Fla.....	0.50	0 05	21, 1893
Omaha, Nebr.....	0.50	0 05	14, 1893
Saint Paul, Minn.....	0.50	0 05	23, 1893
Boston, Mass.....	0.50	0 05	12, 1892
Savannah, Ga.....	0.50	0 05	28, 1891
Atlanta, Ga.....	0.45	0 05	1, 1892
Indianapolis, Ind.....	0.45	0 05	19, 1891
Jacksonville, Fla.....	0.45	0 05	19, 1892
Wilmington, N. C.....	0.43	0 05	18, 1887
New York, N. Y.....	0.43	0 05	18, 1887
Galveston, Tex.....	0.40	0 05	4, 1891
Kansas City, Mo.....	0.40	0 05	15, 1891
Eastport, Me.....	0.40	0 05	12, 1891
Saint Louis, Mo.....	0.40	0 05	7, 1892
Tampa, Fla.....	0.40	0 05	9, 1892
Galveston, Tex.....	0.39	0 05	22, 1891
Norfolk, Va.....	0.38	0 05	31, 1892
Savannah, Ga. †.....	0.37	0 05	30, 1893
Boston, Mass.....	0.37	0 05	6, 1893
Philadelphia, Pa.....	0.35	0 05	28, 1891
Cleveland, Ohio.....	0.35	0 05	19, 1892
Dodge City, Kans.....	0.35	0 05	23, 1892
New York, N. Y. †.....	0.35	0 05	23, 1893
Jupiter, Fla.....	0.35	0 05	19, 1893
Saint Louis, Mo.....	0.35	0 05	2, 1890
Saint Paul, Minn.....	0.35	0 05	11, 1891
Atlanta, Ga.....	0.35	0 05	20, 1891
Dodge City, Kans.....	0.34	0 05	18, 1891
Savannah, Ga.....	0.34	0 05	12, 1891
Memphis, Tenn.....	0.32	0 05	16, 1892
Norfolk, Va.....	0.32	0 05	28, 1893
Galveston, Tex.....	0.31	0 05	9, 1892
Bismarck, N. Dak.....	0.30	0 05	27, 1892
Buffalo, N. Y.....	0.30	0 05	19, 1892



## One hour and less—Continued.

Station and state.	Amount.	Time.	Date.
	Inches.	h. m.	
Jupiter, Fla.	0.30	0 05	14, 1892
New York, N. Y.	0.30	0 05	23, 1891
Buffalo, N. Y.	0.30	0 05	28, 1893
Washington, D. C.	0.30	0 05	1, 1890
Norfolk, Va.	0.30	0 05	26, 1891
Galveston, Tex.	0.30	0 05	25, 1893
Eastport, Me.	0.27	0 05	5, 1892
Indianapolis, Ind.	0.25	0 05	19, 1892
Baltimore, Md.	0.25	0 05	29, 1893
Jacksonville, Fla.	0.25	0 05	6, 1893
Do	0.25	0 05	9, 1893
Wilmington, N. C.	0.25	0 05	30, 1892
Jupiter, Fla.	0.25	0 10	21, 1893
Boston, Mass.	0.80	0 10	12, 1892
Jacksonville, Fla.	0.80	0 10	31, 1892
Tampa, Fla.	0.80	0 10	9, 1892
Omaha, Nebr.	0.80	0 10	14, 1893
Galveston, Tex.	0.75	0 10	4, 1890
Boston, Mass.	0.70	0 10	6, 1893
Saint Paul, Minn.	0.70	0 10	23, 1893
Atlanta, Ga.	0.65	0 10	1, 1892
Dodge City, Kans.	0.60	0 10	9, 1892
Key West, Fla.	0.60	0 10	30, 1891
New York, N. Y.	0.59	0 10	4, 1888
Savannah, Ga.	0.56	0 10	14, 1893
Norfolk, Va.	0.57	0 10	31, 1892
Bismarck, N. Dak.	0.56	0 10	27, 1892
Cleveland, Ohio	0.56	0 10	19, 1892
Saint Louis, Mo.	0.51	0 10	7, 1892
Jupiter, Fla.	0.50	0 10	14, 1892
New York, N. Y.	0.50	0 10	19, 1893
Salisbury, N. C.	0.50	0 10	13, 1888
Franklin Furnace, N. J.	0.99	0 15	19, 1893
Charleston, S. C.	1.41	0 18	9, 1890
Lead Hill, Ark.	1.00	0 18	2, 1882
Jupiter, Fla.	2.12	0 20	21, 1893
Trenton, S. C.	1.42	0 20	18, 1893
Brooksville, Fla.	1.40	0 20	1, 1893
Escanaba, Mich.	1.27	0 20	11, 1877
Marksville, La.	1.25	0 20	27, 1892
Albany, N. Y.	1.20	0 20	2, 1878
Fox Creek, Mo.	1.15	0 20	25, 1893
Glenville, W. Va.	1.14	0 20	12, 1892
Nashville, Tenn.	1.10	0 20	17, 1891
Emporium, Pa.	1.05	0 20	5, 1890
Parkersburg, W. Va.	1.01	0 20	1, 1890
Mossing Ford, Va.	1.00	0 20	2, 1890
Abilene, Tex.	1.00	0 20	29, 1892
Louisville, Ky.	1.26	0 23	20, 1878
Hardin, Colo.	1.52	0 24	13, 1890
Galveston, Tex.	1.55	0 25	17, 1871
Ithaca, N. Y.	1.47	0 25	4, 1892
Colorado Springs, Colo.	2.75	0 30	14, 1890
Mesquite, Tex.	2.50	0 30	10, 1875
Jupiter, Fla.	2.35	0 30	20, 1893
Stella, Tex.	2.05	0 30	4, 1893
Lebo, Kans.	2.01	0 30	22, 1892
Somerville, N. J.	2.00	0 30	19, 1893
Wellsboro, Pa.	1.95	0 30	21, 1885
Montevideo, Minn.	1.95	0 30	19, 1893
Vevay, Ind.	1.90	0 30	13, 1879
Grantsburg, Wis.	1.88	0 30	7, 1889
Manistee, Mich.	1.67	0 30	8, 1892
Emilie, La.	1.62	0 30	7, 1893
Queensbury, N. Y.	1.56	0 30	14, 1890
Mount Auburn, Ohio.	1.52	0 30	26, 1880
Providence, R. I.	3.50	0 35	6, 1878
Auburn, N. H.	3.00	0 35	27, 1877
Hulmeville, Pa.	2.20	0 35	25, 1880

## One hour and less—Continued.

Station and state.	Amount.	Time.	Date.
	Inches.	h. m.	
Pittsburg, Pa.	1.85	0 35	16, 1884
Cincinnati, Ohio.	1.85	0 35	27, 1882
Silver Falls, Tex.	1.82	0 35	20, 1893
Quitman, Ga.	2.30	0 40	30, 1893
Sharon Springs, Kans.	2.00	0 40	20, 1892
Jacksonville, Fla.	3.72	0 41	20, 1873
Philo, Ill.	2.63	0 45	5, 1892
Hudson, Wis.	2.50	0 45	11, 1891
Detroit, Mich.	2.48	0 45	31, 1878
Sandusky, Ohio.	0.25	0 45	24, 1892
Charlotte, N. C.	2.01	0 45	3, 1890
Weldon, N. C.	3.43	0 50	22, 1892
Fort Union, N. Mex.	3.34	0 50	12, 1883
Bushnell, Ill.	4.02	1 00	5, 1893
Princeton, Mo.	4.00	1 05	15, 1891
Campo, Cal.	11.50	1 20	12, 1891
Plover, Wis.	4.50	1 30	3, 1890

† Record incomplete.

## HAIL.

Description of the more severe hailstorms reported for the month is given under "Local storms."

Hail was reported as follows: 1st, Colorado, Florida, and Texas. 3d, Ohio. 4th, Arizona, Colorado, Ohio, Pennsylvania, and Wisconsin. 5th, Colorado, Illinois, Maryland, Missouri, and Nebraska. 6th, Colorado, Maryland, Massachusetts, New Hampshire, New Jersey, Pennsylvania, and Tennessee. 7th, Massachusetts, New Hampshire, Texas, and Utah. 8th, Colorado, Iowa, Minnesota, Mississippi, New Mexico, Texas, and Wisconsin. 9th, Colorado, North Dakota, and South Dakota. 10th, Colorado, Iowa, Kansas, Missouri, Texas, and Wisconsin. 11th, Arkansas and Nevada. 12th, South Dakota and Utah. 13th, Arizona and Idaho. 14th, Colorado and Nebraska.

15th, Colorado. 16th, Colorado, Minnesota, Oregon, and Utah. 17th, Kansas, Minnesota, Nebraska, Pennsylvania, and Wisconsin. 18th, Colorado and Michigan. 19th, Colorado, Idaho, Kansas, Michigan, Minnesota, Nebraska, New Jersey, Pennsylvania, and South Dakota. 20th, Minnesota. 21st, Colorado, Iowa, Minnesota, New Mexico, and Texas. 23d, Colorado, Minnesota, and South Dakota. 24th, Connecticut, Michigan, Minnesota, and Wisconsin. 25th, Colorado, Kentucky, Missouri, New York, and Tennessee. 26th, Minnesota, Nebraska, and South Dakota. 27th, Michigan, Minnesota, Nebraska, New York, and Vermont. 28th, Colorado and South Dakota. 29th, California, Colorado, Iowa, Massachusetts, and New Mexico. 30th, Colorado and New Mexico. 31st, Idaho and Utah.

## WINDS.

The prevailing winds in August, 1893, are shown on Chart II by arrows flying with the wind. In New England and on the northeast slope of the Rocky Mountains the winds were generally from southwest to northwest; in the middle and south Atlantic states and the Ohio Valley and Tennessee, northeast; in the Florida Peninsula, southeast to southwest; in the west Gulf states, the Missouri Valley, and on the southeast slope of the Rocky Mountains, southeast to south; on the Pacific coast, west to northwest; in the Lake region, the extreme northwest, and the upper Mississippi valley, variable.

HIGH WINDS.  
(In miles per hour.)

Wind velocities of 50 miles, or more, per hour were reported at regular stations of the Weather Bureau as follows:

10th, 63, sw., at Des Moines, Iowa; 56, s., at Kearney, Nebr.

12th, 59, w., at Pikes Peak, Colo. 14th, 52, w., at Fort Buford, N. Dak.; 52, s., at Amarillo, Tex. 18th, 50, se., at Huron, S. Dak. 21st, 72, ne., at Block Island, R. I.; 60, n., at Woods Holl, Mass.; 52, ne., at Nantucket, Mass. 23d, 70, ne., at Kittyhawk, N. C.; 60, n., at Hatteras, N. C.; 52, ne., at Atlantic City, N. J.; 50, nw., at Sioux City, Iowa. 24th, 55, ne., at Philadelphia, Pa.; 54, s., at New London, Conn.; 52, e., at Woods Holl, Mass. 27th, 88, e., at Charleston, S. C.; 72, ne., at Savannah, Ga.; 55, w., at Titusville, Fla.; 53, s., at Southport, N. C. 28th, 96, e., at Charleston, S. C.; 72, s., at Southport, N. C.; 52, ne., at Augusta, Ga.; 50, ne., at Chicago, Ill.; 50, s., at Kittyhawk, N. C.; 50, sw., at Savannah, Ga. 29th, 59, s., at Woods Holl, Mass.; 57, s., at New Haven, Conn.; 57, se., at New London, Conn.; 54, se., at New York, N. Y.; 51, n., at Oswego, N. Y.; 50, s., at Kittyhawk, N. C. 31st, 55, e., at Tatoosh Island, Wash.

## LOCAL STORMS.

(75th meridian time is used at regular Weather Bureau stations.)

**1st.**—A severe thunder, rain, and wind storm passed over Dinwiddie County, Va., in the evening; one man was killed and another stunned by lightning. A heavy cloudburst occurred in the vicinity of White Oaks, N. Mex. The main force of the storm passed one or two miles east of the town; a house and a number of corrals were destroyed and other damage done. The Bonita River overflowed its banks and roads were rendered impassable.

**2d.**—A severe rainstorm occurred at Bisbee, Ariz., in the evening; one building was swept away and several houses were flooded.

**3d.**—A heavy rain and thunderstorm at Lookout Mountain, Tenn., delayed railroad traffic, and minor damage was done by lightning.

**4th.**—Thunder and rain storms occurred in Pennsylvania, Virginia, Ohio, and Indiana. At Pittsburg, Pa., a thunder and rain storm occurred in the early morning; small creeks were flooded. A house near Emsworth, Pa., was struck by lightning, and hail was reported to have fallen at Moon, Pa. At Coraopolis, Pa., a severe thunderstorm occurred in the afternoon; an oil tank was set on fire, and damage was done to electric wires. A cloudburst was reported at Petersburg, Va., at 11.30 a. m.; much damage was done by flood. The Appomattox River rose 6 feet in one hour and a half. The rain in the adjoining counties was very heavy, and much damage was done to crops and bridges. Destructive thunderstorms occurred in southwestern Ohio; at Oxford, Ohio, the storm was attended by heavy hail, beating down corn and killing poultry. A severe thunderstorm, with heavy rain, visited Sharpsburg, Ind., in the early morning, doing great damage to crops and property.

**5th.**—Severe hailstorms were reported in Michigan and Missouri and heavy rain fell in Texas and Arizona. In Gratiot County, Mich., great damage was done to crops by hail, and several buildings were struck by lightning. Adair County, Mo., was visited by a severe hailstorm, with thunder and lightning, in the afternoon. Crops, gardens, and roofs were greatly damaged by the hail, and cattle and horses were killed by lightning. At El Paso, Tex., damage was done by flood. Heavy rain washed out railroads east and west of Tucson, Ariz., and railroad traffic was delayed.

**6th.**—Severe thunderstorms occurred in the New England and middle Atlantic states and Florida. Much damage was done in Boston, Mass., and vicinity. In Lynn, Mass., the damage was estimated at nearly \$100,000. A sudden and severe storm of wind and rain broke over Philadelphia, Pa., at 4.25 p. m. The temperature fell from 90° to 61°; for 30 minutes the wind blew in violent gusts, attaining an extreme velocity of 60 miles per hour. Much damage was done in the north part of the city, and on the river small boats were capsized. At Le Roy, Chanceford, and Hopewell, Pa., the storm was attended by hail, and considerable damage was done to corn, buckwheat, and tobacco. During a thunderstorm at Jacksonville, Fla., in the evening, a barn was struck by lightning.

**7th.**—Thunderstorms continued over New England. At Hanover, N. H., 4 barns were struck by lightning. A severe hailstorm, with heavy thunder and lightning, visited Keene, N. H., about 7 a. m., and considerable damage was done to crops.

**8th.**—Thunderstorms were reported in New York, Florida, Colorado, and New Mexico. At Pueblo, Colo., a thunder and rain storm occurred in the evening. Heavy rain washed out railroads; estimated damage, \$25,000. At Fort Stanton, N. Mex., a thunderstorm occurred in the evening and hail fell for 3 minutes. A tremendous cloudburst occurred west of the station, and much damage was done by washouts and to bridges. The Rio Bonita overflowed its banks.

**10th.**—Damage was done by a heavy rain and hail storm at Paducah, Ky. Heavy rain fell in parts of Iowa. At Des Moines a thunderstorm began shortly after 1 p. m. and continued until 6.05 p. m. The wind reached a maximum velocity of 60 miles per hour. During a thunderstorm at Kansas City, Mo., in the afternoon a house was struck by lightning. A violent storm occurred about 6 miles south of Larned, Kans., between 4 and 5 p. m. Nine funnel-shaped clouds were observed within a distance of 9 miles. Two clouds, one moving northeast and the other south, met, both having a whirling motion in opposite directions. Damage, \$1,000. At Bucklin, Kans., about 50 miles southwest of Larned, two distinct tornadoes formed north and east of that place; not much damage done. During a thunderstorm, with hail, at McCoy, Colo., damage was done to vegetation.

**12th.**—Severe thunderstorms prevailed in New Hampshire, Massachusetts, and Kansas, and a severe local storm occurred in Pennsylvania. At New Brunswick, N. J., a heavy thunderstorm began at 2.27 and ended at 6 p. m.; heavy rain fell, and the temperature dropped from 95° to 71°. A sudden squall, lasting 3 minutes, did some damage to corn. Nanticoke, Pa., was visited by a local storm in the afternoon. The path of the storm was about 1½ mile long and 1 mile wide; it moved in a northwest direction, spending its force along the Susquehanna River. Heavy rain fell after the storm. A house was struck by lightning and 2 persons in the house were killed; the house was lifted from its foundation and carried 50 yards. Six other houses were badly wrecked and the inmates more or less injured. Hundreds of trees were torn up by the roots. At Winona, Kans., a thunderstorm moved northeast, with light rain and small hail, at 2 p. m.; 2 children were killed, and damage was done to property. During a severe thunderstorm 12 miles southeast of Rushville, Kans., a man and 2 horses were killed and 2 persons were stunned by lightning.

**13th.**—At Vineyard Haven, Mass., a house was struck by lightning and damaged to the extent of \$500. Heavy rainstorms prevailed in Arizona. At Farleys Camp, Ariz., a very heavy rainstorm began at 5 p. m. and continued until 11.30 p. m.; some damage was done to roads, vegetation, and grain. At Crittendon and Florence, Ariz., the storm was attended by terrific thunder, rain, hail, and gusts of wind. At Holbrook, Ariz., 1.40 inches of rain fell in 45 minutes.

**14th.**—At Selma, S. C., a heavy wind and rain storm destroyed crops on lowlands. At Erie, Pa., the wind reached a velocity of 25 miles per hour; on Lake Erie the gale was more severe and boats were compelled to return to port. Severe thunderstorms prevailed in Nebraska. At Omaha, Nebr., a severe thunder and rain storm occurred in the afternoon. The wind reached a maximum velocity of 34 miles per hour; streets were flooded. During a heavy thunderstorm at Mapleton, Nebr., a house was struck by lightning; loss \$2,500. A very destructive hailstorm occurred in the northwestern part of Kansas. Great damage was done to crops and cattle were killed by the heavy hail.

**15th.**—A tornado occurred in southeastern Nebraska. The storm struck Pawnee City, Nebr., at 4.30 p. m.; moved northeast; a funnel-shaped cloud with a whirling motion from left to right was observed. A number of persons were injured, and the damage to property was placed at \$4,000. The storm passed just south of Table Rock, where houses were demolished and 1 person was badly injured. Six miles north of Humboldt everything in the storm's path was destroyed, and several persons were injured. At Beatrice, Nebr., heavy rain fell for 24 hours; great damage was done to bridges and railroads. Heavy rain in northeastern Kansas washed out railroads; all small streams overflowed their banks and great damage was done to property. During a heavy thunderstorm at First View, Colo., a house was struck by lightning.



**16th.**—Hail destroyed gardens and broke glass about Bird Island, Minn.

**17th.**—During a thunderstorm at Arkadelphia, Ark., in the evening, a man was killed by lightning. Hail destroyed crops in central Minnesota. An exceptionally severe rain and thunder storm visited the country about Syracuse, Kans. The storm was attended by a heavy downpour of rain, incessant lightning, and high wind. The town of Syracuse was flooded; stock was drowned, and great damage was done to property.

**18th.**—Some damage was done at Seibert, Colo., by hail.

**19th.**—Thunderstorms occurred in New Jersey and destructive hailstorms in Minnesota. At Somerville, N. J., a thunderstorm, with hail, occurred in the afternoon; damage was done to property and crops. In western and southwestern Minnesota damage was done to crops and property by hail. At Dodge City, Kans., a thunderstorm began at 2.20 and ended at 6.18 p. m., with heavy rain from 3.05 to 5.10 p. m.; 2 miles west of Dodge City railroads were washed out. An unusually severe thunderstorm struck Denison, Tex., about 5.30 p. m.; several persons were struck by lightning and damage was done to property. At Santa Fe, N. Mex., a thunderstorm began at 8.23 and continued until 10.40 p. m.

**20th.**—A violent electric storm passed over Waco, Tex., in the morning; a man was struck by lightning and damage was done to buildings. During a thunderstorm at Pueblo, Colo., in the evening, minor damage was done by lightning.

**21st.**—A severe thunderstorm occurred 4 miles west of Ellendale, N. Dak.; a man was killed by lightning.

**23d.**—A heavy thunder and rain storm occurred at Minneapolis, Minn., in the evening. At Bird Island, Minn., a hailstorm destroyed gardens and broke glass. At Sioux City, Iowa, a heavy rain and thunder storm began at 5.30 p. m.; a house was struck by lightning, and damage to property by flood was estimated at \$40,000. During a thunderstorm at Hutchinson, Kans., a horse was killed by lightning.

**24th.**—At Valparaiso, Ind., a barn was struck by lightning and burned, together with 5 horses and 2 cows. A heavy thunderstorm, with high wind and some hail, passed north-

west of Waukesha, Wis.; 2 barns were struck by lightning and damage was done to corn and grain. At Minneapolis, Minn., a thunder and rain storm began at 8.30 a. m. and ended at 11.48 a. m.; hail fell for 10 minutes. A second storm began at 12.25 and ended at 3.12 p. m.; 4.08 inches of rain fell in the two storms. A house was struck by lightning and damage was done by flood. During a heavy thunderstorm at Red Wing, Minn., in the early morning, the wind reached a maximum velocity of 32 miles per hour. A house was struck by lightning.

**26th.**—A heavy thunder and rain storm occurred 10 miles south of Bowling Green, Ky., accompanied by high wind and hail. Damage was done to corn and tobacco.

**27th.**—Five miles north of Lebanon Springs, N. Y., a barn was struck by lightning and burned. During a heavy thunderstorm at New Lisbon, N. Y., several barns were struck by lightning. A violent electric storm visited Rome, N. Y., about 3 p. m.; rain fell in torrents, accompanied by heavy hail. Damage was done to property. In Lewis County, N. Y., several buildings were struck by lightning. A destructive gale passed over Kiowa, Kans., in the early morning. Brick buildings and heavy plate glass windows had the appearance of being struck by grapeshot. At one place the clouds appeared to dip, and outhouses, small buildings, etc., were picked up and scattered in all directions. A heavy storm at Sterling, Kans., prostrated crops.

**28th.**—During a heavy thunderstorm at Bear Valley, S. Dak., a house was struck by lightning and a child killed. A cloudburst in the mountains in northwestern Arizona caused considerable damage by flood.

**29th.**—A horse was killed by lightning near Wellington, Nev.

**31st.**—During a thunderstorm at Petersham, Mass., 3 children were killed by lightning. At Chattanooga, Tenn., a heavy thunder and rain storm began in the evening and continued until midnight. In the northeast suburbs the rain was very heavy and damage was done to railroads. Considerable damage was done at Salt Lake City, Utah, by a severe windstorm.

## INLAND NAVIGATION.

### STAGE OF WATER IN RIVERS.

The following table shows the danger-points at the various river stations; the highest and lowest stages for the month, with the dates of occurrence; and the monthly ranges:

*Heights of rivers above low-water mark, August, 1893.*

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
<i>Red River.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>
Shreveport, La. ....	29.2	5.0	1	0.9	16	4.1
<i>Arkansas River.</i>						
Fort Smith, Ark. ....	22.0					
Little Rock, Ark. ....	23.0	7.9	19	4.6	6	3.3
<i>Missouri River.</i>						
Fort Buford, N. Dak. ....	25.0	10.5	1	7.2	31	3.3
Bismarck, N. Dak. ....	75.0	5.1	1	2.6	30, 31	2.5
Pierre, S. Dak. ....	13.0					
Sioux City, Iowa ....	18.7	9.5	1-4	7.0	31	2.5
Omaha, Nebr. ....	18.0	8.9	1	7.1	31	1.8
Kansas City, Mo. ....	21.0	13.2	19	7.8	31	5.4
<i>Mississippi River.</i>						
Saint Paul, Minn. ....	14.0	2.6	31	1.8	11	0.8
La Crosse, Wis. ....	10.0	2.9	1	1.9	24, 25, 28-31	1.0
Dubuque, Iowa ....	16.0	3.4	1	1.7	30, 31	1.7
Davenport, Iowa ....	15.0	2.4	1, 2	0.9	30, 31	1.5
Keokuk, Iowa ....	14.0	2.6	1	0.8	30, 31	1.8
Hannibal, Mo. ....	17.0	3.4	1	1.5	30, 31	1.9
Saint Louis, Mo. ....	30.0	11.3	3	5.7	31	5.6
Cairo, Ill. ....	40.0	11.3	5	6.0	31	5.3
Memphis, Tenn. ....	33.0	8.5	1	4.5	24, 25	4.1
Vicksburg, Miss. ....	41.0	14.3	1	4.2	29	10.1
New Orleans, La. ....	13.0	7.2	1	3.4	30, 31	3.8

### Heights of rivers—Continued.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
<i>Ohio River.</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>
Parkersburg, W. Va. ....	38.0					
Cincinnati, Ohio ....	45.0	6.0	10, 11	3.6	29, 30	2.4
Louisville, Ky. ....	24.0	3.6	1	2.3	29-31	1.3
<i>Cumberland River.</i>						
Nashville, Tenn. ....	40.0	8.4	4	1.2	27	7.2
<i>Tennessee River.</i>						
Chattanooga, Tenn. ....	33.0	5.2	18	1.6	28, 29, 31	3.6
Knoxville, Tenn. ....	29.0					
<i>Monongahela River.</i>						
Pittsburg, Pa. ....	22.0	6.5	29	5.3	6, 7, 30	1.2
<i>Savannah River.</i>						
Augusta, Ga. ....	32.6	12.9	29	5.0	26	7.9
<i>Willamette River.</i>						
Portland, Oregon ....	15.0	12.7	1	5.1	31	7.6
<i>Susquehanna River.</i>						
Harrisburg, Pa. ....	17.0	3.1	31	0.3	16-19, 25	2.8
<i>Alabama River.</i>						
Montgomery, Ala. ....	48.0	14.1	16	0.8	31	13.3
<i>James River.</i>						
Lynchburg, Va. ....	18.0	11.3	29	0.0	10-13, 16-19, 23, 27, 28	11.3
<i>Sacramento River.</i>						
Red Bluff, Cal. ....	22.0	1.6	1	1.3	17-31	0.3
Sacramento, Cal. ....	25.0	12.0	1	9.0	31	3.0
<i>Des Moines River.</i>						
Des Moines, Iowa ....	19.0					

## ATMOSPHERIC ELECTRICITY.

## THUNDERSTORMS.

Description of the more severe thunderstorms reported for the month is given under "Local storms."

Thunderstorms were reported as follows: East of the Rocky Mountains they were reported in the greatest number of states, 31, on the 17th; in 20 to 30 on the 1st, 5th to 8th, 10th, 11th, 12th, 16th, 18th, 19th, 20th, 25th, and 26th; in 10 to 19 on the 2d, 3d, 4th, 9th, 13th, 14th, 15th, 21st to 24th, 27th, 28th, and 29th; and in 9 on the 30th and 31st.

East of the Rocky Mountains thunderstorms were reported on the greatest number of dates, 31, in Florida; on 20 to 30 in Alabama, Kansas, Louisiana, Minnesota, Mississippi, Missouri, Nebraska, North Carolina, South Carolina, South Dakota, Tennessee, and Texas; on 10 to 19 in Arkansas, Georgia, Iowa, Kentucky, Massachusetts, Michigan, New Hampshire, New Jersey, New York, North Dakota, Ohio, Oklahoma, Pennsylvania, and Wisconsin; and on 1 to 9 in Connecticut, District of Columbia, Illinois, Indiana, Maine, Maryland, Montana, Rhode Island, Vermont, Virginia, and West Virginia. Delaware and Indian Territory were the only states in which thunderstorms were not reported.

West of the Rocky Mountains thunderstorms were reported in Arizona on the 1st to 6th, 12th to 26th, 28th to 31st; in California on the 3d, 4th, 27th, and 29th; in Colorado on the 1st to 31st; in Idaho on the 3d, 4th, 6th, 13th, 19th, 20th, 21st, 29th, and 30th; in Nevada on the 1st to 6th, 8th, 11th, 12th, 13th, 16th, 22d, and 25th to 30th; in New Mexico on the 1st, 8th, 14th, 16th to 19th, 21st, 27th, and 31st; in Oregon on the 1st, 16th, 17th, and 21st; in Utah on the 1st, 3d to 7th, 11th, 13th, 14th, 16th, 18th, 20th, 21st, 25th, 26th, and 30th; in Washington on the 5th, 6th, 13th, 17th, 19th, 20th, and 21st; and in Wyoming on the 3d, 8th, 13th, 14th, and 22d.

## AURORAS.

## Auroral displays of August, 1893.

Date.	Station.	Extent of display.		Remarks.
		Azimuth.	Altitude.	
5-5	Duluth, Minn.....	Cov'd 90	18	Arch, with streamers.
6-5	Red Wing, Minn.....	90 to 270	60	Waves of light nearly to zenith.
6-7	Eastport, Me.....	90 to 270	10	Low arch; waves of light to zenith.
6-7	New London, Conn....	135 to 225	.....	Streamers; waves of light, having a quick motion, extended nearly to zenith.
6-7	Oswego, N. Y.....	.....	.....	Brilliant flashes of light near zenith and a partial corona a few degrees sw. of zenith.
6-7	Chicago, Ill.....	135 to 270	.....	A narrow belt of pale green, with occasional white streamers and flashes of light to zenith.
6	Riley, Ill.....	45 to 225	.....	Arch in n., with streamers in motion from e. to w.
6	Alpena, Mich.....	90 to 225	80	Beams of white light.
6-7	Detroit, Mich.....	135 to 225	80	White light, with occasional pink tint; waves of light moved with great rapidity to zenith.

## Auroral displays—Continued.

Date.	Station.	Extent of display.		Remarks.
		Azimuth.	Altitude.	
6-7	Manistee, Mich.....	.....	60	Flashes of light to zenith; beams of light moved slowly from w. to e.
6	Marquette, Mich.....	In north.	Zenith.	Waves of silvery light to zenith, and luminous clouds to 140°.
6-7	Sault Ste. Marie, Mich	135 to 315	100	Tea-green color, with a waving motion and luminous beams of light.
6-7	La Crosse, Wis.....	150 to 240	.....	Streamers to 45° and bright waves of light to beyond zenith.
6-7	Milwaukee, Wis.....	.....	.....	An arch, with streamers of white at times, covering entire sky; a curtain-like appearance with a waving motion.
6-7	Minneapolis, Minn....	112 to 247	.....	Arch, with streamers to zenith and a few beyond.
6	Saint Cloud, Minn....	.....	.....	Bright waves and streamers, rapidly changing in form and color.
6	Saint Paul, Minn.....	180 to 210	20	Faint white light; numerous streamers to 70° appeared and disappeared in rapid succession.
6	Amana, Iowa.....	Cov'd 90	10	Streamers and waves of light to 45°.
6-7	Des Moines, Iowa.....	In north.	.....	Arch in n., with many bright streamers of green and pink.
6-7	Dubuque, Iowa.....	135 to 225	.....	Slender beams nearly to zenith; a cloud-like formation appeared and disappeared in rapid succession.
6	Sioux City, Iowa.....	135 to 225	45	An arch, with waves of light of a greenish tint; shaft of light in nw. to zenith.
6-7	Bismarck, N. Dak....	90 to 270	105	A band of light, with a quick motion, like the folds of a curtain; bright purple streamers.
6	Fort Buford, N. Dak..	In north.	.....	A corona in n.; the display was very brilliant and active.
6-7	Huron, S. Dak.....	110 to 300	50	A diffused light in n.; beautiful beams of light to 50°.
6-7	Midland, S. Dak.....	135 to 315	.....	Bright waves of light to zenith.
6-7	Rapid City, S. Dak....	95 to 185	.....	An arch s. of zenith, with "merry dancers."
6	Oelrichs, S. Dak.....	.....	.....	Arch resting on dark segment; white streamers.
6-7	Yankton, S. Dak.....	150 to 220	45	Bright glow; small streamers.
6-7	Pierre, S. Dak.....	120 to 245	45	Arch in n.; small streamers.
6-7	Helena, Mont.....	90 to 270	.....	Beam of light, followed by occasional shooting beams of light to altitude 25°.
6-7	Miles City, Mont.....	In north.	.....	Tremulous beams, with a waving motion; "merry dancers" to zenith.
6-7	Kearney, Nebr.....	160 to 225	.....	Pale orange color resting on a dark arch; streamers to 45°.
6	Valentine, Nebr.....	In north.	24	Rays of white light resting on a dark segment; pale streamers moving from n. to w.
7	Spokane, Wash.....	In north.	20	Began at 12.10 a. m.; diffused light in n. on dark segment; several beams to altitude 55°.
6	Albany, Oregon.....	135 to 225	50	Pale yellow streamers tinged with rose color.
6	Heppner, Oregon.....	.....	60	Luminous beams in n. sky; streamers in continual motion.
7	Saint Paul, Minn.....	170 to 205	80	Vertical beams appeared and disappeared in rapid succession.
12	Marquette, Mich.....	.....	.....	Arch resting on dark segment; a silvery white light, with upper edges tinged with pink.
12	Bismarck, N. Dak....	165 to 240	15	Arch; few indistinct streamers.
13	Cheyboygan, Mich.....	Cov'd 50	.....	Brilliant streamers to zenith.
15-16	Pierre, S. Dak.....	130 to 220	30	Cloud-like appearance, through which light passed in rippling waves.
18	Marquette, Mich.....	95 to 275	Zenith.	Scattered luminous clouds in n.; streamers to zenith.
18	Milwaukee, Wis.....	In north.	45	Arch; rays of light in n.
18	Red Wing, Minn.....	170 to 190	70	Faint gray light.
18	Saint Paul, Minn.....	170 to 210	60	Faint white light, with numerous beams.

## STATE WEATHER SERVICES.

[Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts and summaries are republished from reports for August, 1893, of the directors of the various state weather services:

## ALABAMA.

**Temperature.**—The mean was 0.6 above the normal; maximum, 100, at Brewton and Eufaula, 29th; minimum, 50, at Newburg, 23d; greatest monthly range, 48, at Newburg; least monthly range, 19, at Elba.

**Precipitation.**—The average was 0.42 above the normal; greatest monthly, 10.51, at Union Springs; least monthly, 0.20, at Clanton.

**Wind.**—Prevailing direction, south. — W. M. Dudley, Observer, Weather Bureau, Montgomery, director.

## ARIZONA.

**Temperature.**—The mean was normal; maximum, 116, at Fort Mohave, 2d; minimum, 40, at Flagstaff, 31st; greatest monthly range, 51, at San Carlos; least monthly range, 26, at Red Rock.

**Precipitation.**—The average was 0.88 above the normal; greatest monthly, 8.99, at Fort Huachuca; least monthly, 0.38, at Yuma.

**Wind.**—Prevailing direction, southwest. — W. Burrows, Observer, Weather Bureau, Tucson, director.



## ARKANSAS.

**Temperature.**—The mean was 1.2 below the normal; maximum, 102, at Warm Springs, 8th; minimum, 48, at Fayette and Keesees Ferry, 30th; greatest monthly range, 48, at Keesees Ferry; least monthly range, 29, at Greenville, Miss.

**Precipitation.**—The average was 0.22 below the normal; greatest monthly, 9.40, at Hamburg; least monthly, 0.62, at Memphis, Tenn.

**Wind.**—Prevailing direction, south.—*F. H. Clarke, Local Forecast Official, Weather Bureau, Little Rock, director.*

## CALIFORNIA.

**Temperature.**—The mean was 1.4 below the normal; maximum, 112, at Tulare, 1st, 2d, 3d; minimum, 39, at Fort Bidwell, 7th and 14th, and at San Jose, 26th; greatest monthly range, 60, at Tulare; least monthly range, 16, at Poway.

**Precipitation.**—The average was 0.02 below the normal; greatest monthly, 0.52, at Needles; least monthly, 0.00; out of 102 stations, but 12 reported an appreciable amount.

**Wind.**—Prevailing direction, west.—*J. A. Barwick, Observer, Weather Bureau, Sacramento, director.*

## COLORADO.

**Temperature.**—The mean was 1.0 below the normal; maximum, 102, at Cheyenne Wells, 8th; minimum, 25, at Pikes Peak, 24th.

**Precipitation.**—The average was about 0.30 above the normal; greatest monthly, 8.40, at Delta; least monthly, 0.11, at Ward District.

**Wind.**—Prevailing direction, west.—*J. J. Gilligan, Observer, Weather Bureau, Denver, director.*

## FLORIDA.

**Temperature.**—The mean was about 1.2 below the normal; maximum, 103, at Mullet Key, 18th and 19th; minimum, 63, at Orlando, 10th; greatest monthly range, 31, at Orlando; least monthly range, 19, at Hypoluxo.

**Precipitation.**—Greatest monthly, 11.10, at Plant City; least monthly, 1.94, at Key West.

**Wind.**—Prevailing direction, southeast.—*E. R. Demain, Observer, Weather Bureau, Jacksonville, director.*

## GEORGIA.

**Temperature.**—Maximum, 100, at Cordele, 3d; minimum, 54, at Diamond, 22d; greatest monthly range, 40, at Adairsville and Ramsey; least monthly range, 19, at Monticello.

**Precipitation.**—Greatest monthly, 17.61, at Mount Vernon; least monthly, 1.05, at Marietta.

**Wind.**—Prevailing direction, northeast.—*Park Morrill, Local Forecast Official, Weather Bureau, Atlanta, director.*

## IDAHO.

**Temperature.**—Maximum, 108, at Payette, 1st; minimum, 27, at Bonanza City, 14th; greatest monthly range, 72, at Payette and American Falls; least monthly range, 55, at Kootenai.

**Precipitation.**—Greatest monthly, 0.56, at Lake; least monthly, 0.00, at Boise Barracks, Fort Sherman, and Payette.

**Wind.**—Prevailing direction, southwest.—*J. H. Smith, Observer, Weather Bureau, Idaho Falls, director.*

## ILLINOIS.

**Temperature.**—The mean was 0.4 below the normal; maximum, 100, at McLeansboro, 6th, Rushville, 9th, and at Ottawa and Olney, 10th; minimum, 38, at Dixon, 30th; greatest monthly range, 60, at Hennepin; least monthly range, 31, at Golconda.

**Precipitation.**—The average was 2.25 below the normal; greatest monthly, 4.89, at Bushnell; least monthly, 0.10, at Fort Sheridan.

**Wind.**—Prevailing direction, northeast.—*John Craig, Observer, Weather Bureau, Springfield, director.*

## INDIANA.

**Temperature.**—The mean was 0.9 above the normal; maximum, 97, at Bedford and Marion, 5th and 8th; minimum, 39, at Lafayette, 30th; greatest monthly range, 58, at Lafayette; least monthly range, 32, at Huntingburg.

**Precipitation.**—The average was 2.33 below the normal; greatest monthly, 4.25, at Huntingburg; least monthly, 0.16, at Franklin.

**Wind.**—Prevailing direction, northeast.—*Prof. H. A. Huston, Lafayette, director; C. F. R. Wappenhans, Local Forecast Official, Weather Bureau, assistant.*

## IOWA WEATHER AND CROP SERVICE.

**Temperature.**—The mean was 1.6 below the normal; maximum, 101, at Bonaparte, 9th; minimum, 30, at Elkador, 30th; greatest monthly range, 68, at Elkador; least monthly range, 43, at Estherville.

**Precipitation.**—The average was about 1.25 below the normal; greatest monthly, 6.22, at Clinton; least monthly, 0.40, at Algona.

**Wind.**—Prevailing direction, northwest.—*J. R. Sage, Des Moines, director; G. M. Chappel, Local Forecast Official, Weather Bureau, assistant.*

## KANSAS.

**Temperature.**—The mean was 1.6 below the normal; maximum, 111, at Grenola, 9th; minimum, 38, at Dodge City, 23d, and at Lakin, 30th; greatest monthly range, 62, at Cunningham; least monthly range, 41, at Syracuse.

**Precipitation.**—The average was 0.91 below the normal; greatest monthly, 7.20, at Luray; least monthly, 0.23, at Grenola.

**Wind.**—Prevailing direction, south.—*T. B. Jennings, Observer, Weather Bureau, Topeka, director.*

## KENTUCKY.

**Temperature.**—The mean was 0.7 below the normal; maximum, 99, at Harrodsburg, 5th, and at Princeton, 10th; minimum, 48, at Harrodsburg, 8th; greatest monthly range, 51, at Harrodsburg; least monthly range, 17, at South Fork.

**Precipitation.**—The average was 2.00 below the normal; greatest monthly, 3.56, at Catlettsburg; least monthly, 0.39, at Franklin.

**Wind.**—Prevailing direction, north.—*Frank Burke, Local Forecast Official, Weather Bureau, Louisville, director.*

## LOUISIANA.

**Temperature.**—The mean was 1.0 above the normal; maximum, 101, at Liberty Hill, 1st; minimum, 52, at Natchitoches, 31st; greatest monthly range, 44, at North Louisiana Experiment Station; least monthly range, 30, at Hamburg.

**Precipitation.**—The average was 0.69 above the normal; greatest monthly, 11.25, at Lake Charles; least monthly, 1.63, at Shreveport.

**Wind.**—Prevailing direction, north.—*R. E. Kerkam, Local Forecast Official, Weather Bureau, New Orleans, director.*

## MARYLAND.

**Temperature.**—Maximum, 97, at Boettcherville, 25th; minimum, 44, at Boettcherville, 15th, and at Oakland, 7th, 8th, and 15th; greatest monthly range, 53, at Boettcherville; least monthly range, 31, at Solomons.

**Precipitation.**—Greatest monthly, 6.26, at Fallston; least monthly, 1.61, at Cambridge.

**Wind.**—Prevailing direction, northwest.—*Dr. William B. Clark, Johns Hopkins University, Baltimore, director; Prof. Milton Whitney, Maryland Agricultural College, secretary and treasurer; C. P. Cronk, Observer, Weather Bureau, in charge.*

## MICHIGAN.

**Temperature.**—The mean was 1.8 below the normal; maximum, 100, at Mottville, 10th; minimum, 31, at Grayling, 7th, and at Paris 31st; greatest monthly range, 64, at Grayling; least monthly range, 40, at Detroit.

**Precipitation.**—The average was 1.85 below the normal; greatest monthly, 5.80, at Lathrop; least monthly, 0.30, at Berrien Springs.

**Wind.**—Prevailing direction, southwest.—*E. A. Evans, Local Forecast Official, Weather Bureau, Detroit, director.*

## MINNESOTA.

**Temperature.**—The mean was 2.3 above the normal; maximum, 101, at Beardsley, 7th and 8th, and at Farmington, 8th; minimum, 30, at Medford and Saint Charles, 29th; greatest monthly range, 67, at Beardsley; least monthly range, 42, at Duluth, Pine River Dam, and Barrett.

**Precipitation.**—The average was 0.33 below the normal; greatest monthly, 7.65, at Wadena; least monthly, 1.38, at Camden.

**Wind.**—Prevailing direction, south.—*E. A. Beals, Observer, Weather Bureau, Minneapolis, director.*

## MISSISSIPPI.

**Temperature.**—The mean was about normal; maximum, 101, at Crystal Springs, 23d and 24th, and at Water Valley, 11th; minimum, 54, at Batesville and Vaiden, 22d, and at Port Gibson, 22d and 30th.

**Precipitation.**—The average was 0.27 above the normal; greatest monthly, 15.75, at Moss Point; least monthly, 0.42, at Hernando.—*R. J. Hyatt, Local Forecast Official, Weather Bureau, Vicksburg, director.*

## MISSOURI.

**Temperature.**—The mean was 2.2 below the normal; maximum, 100, at Fayette, 8th; minimum, 40, at Darksville, 29th, at Bethany, Panacea, and Warrensburg, 30th, and at Houston and Rea, 31st; greatest monthly range, 58, at Plattsburg; least monthly range, 32, at McCune.

**Precipitation.**—The average was 1.24 below the normal; greatest monthly, 6.63, at Rea; least monthly, 0.20, at Wheatland.

**Wind.**—Prevailing direction, north.—*J. R. Rippey, Secretary, State Board of Agriculture, Columbia, director; H. A. McNally, Observer, Weather Bureau, assistant.*

## MONTANA.

No report received from this service in time for this REVIEW.

## NEBRASKA.

**Temperature.**—The mean was 2.0 below the normal; maximum, 110, at Indianola, 4th; minimum, 35, at Hartington, 8th, and at Oakdale, 29th; greatest monthly range, 68, at Indianola; least monthly range, 34, at Stanton.

**Precipitation.**—The average was 0.27 below the normal; greatest monthly, 7.91, at Table Rock; least monthly, 0.25, at Mullen.

**Wind.**—Prevailing direction, south.—*George E. Hunt, Local Forecast Official, Weather Bureau, Omaha, director.*

## NEVADA.

**Temperature.**—The mean was 0.9 below the normal; maximum, 104, at Palisade, 2d, and at Mill City and Downeyville, 4th; minimum, 25, at Stofiel, 21st; greatest monthly range, 73, at Stofiel.

**Precipitation.**—The average was 0.48 below the normal; greatest monthly, 1.27, at Palmetto.

**Wind.**—Prevailing direction, southwest.—*Prof. Charles W. Friend, Carson City, director; F. A. Carpenter, Observer, Weather Bureau, assistant.*

#### NEW ENGLAND.

**Temperature.**—The average was 0.3 above the normal; maximum, 102, at Farmington, 10th; minimum, 34, at Hyde Park, 14th; greatest monthly range, 64, at Stratford and Jacksonville; least monthly range, 21, at Nantucket.

**Precipitation.**—The average was 0.55 above the normal; greatest monthly, 9.18, at Wells; least monthly, 2.31, at Stratford.

**Wind.**—Prevailing direction, southwest.—*J. Warren Smith, Observer, Weather Bureau, Boston, director.*

#### NEW JERSEY.

**Temperature.**—The mean was 0.8 above the normal; maximum, 99, at River Vale, 6th; minimum, 38, at Charlotteburg, 14th; greatest monthly range, 57, at River Vale; least monthly range, 28, at Atlantic City.

**Precipitation.**—The average was 1.78 above the normal; greatest monthly, 11.94, at Belvidere; least monthly, 3.55, at Atlantic City.

**Wind.**—Prevailing direction, southwest.—*E. W. McGann, Observer, Weather Bureau, New Brunswick, director.*

#### NEW MEXICO.

**Temperature.**—The mean was slightly below the normal; maximum, 103, at Embudo, 14th; minimum, 34, at Fort Wingate, 26th; greatest monthly range, 59, at Monero; least monthly range, 33, at La Luz.

**Precipitation.**—The average was considerably above the normal; greatest monthly, 6.97, at Las Vegas; least monthly, 0.42, at Olio.—*H. B. Hersey, Observer, Weather Bureau, Santa Fe, director.*

#### NEW YORK.

**Temperature.**—The mean was 0.6 above the normal; maximum, 91, at Madison Barracks, 8th; minimum, 33, at South Kortright, 14th; greatest monthly range, 62, at Eden Center; least monthly range, 32, at Setauket.

**Precipitation.**—The average was 2.33 above the normal; greatest monthly, 12.48, at Easton; least monthly, 2.01, at Fleming.

**Wind.**—Prevailing directions, northwest and southwest.—*Prof. E. A. Fuertes, Dean of the College of Civil Engineering, Cornell University, Ithaca, director; R. M. Hardinge, Observer, Weather Bureau, assistant.*

#### NORTH CAROLINA.

**Temperature.**—The mean was 1.1 below the normal; maximum, 98, at Chapel Hill, 12th; minimum, 41, at Blowing Rock, 15th; greatest monthly range, 47, at Mount Airy; least monthly range, 21, at Hatteras.

**Precipitation.**—The average was 1.00 above the normal; greatest monthly, 14.29, at Columbus; least monthly, 2.41, at Bryson City.

**Wind.**—Prevailing direction, northeast.—*Dr. Herbert B. Battle, Raleigh, director; C. F. von Herrmann, Observer, Weather Bureau, assistant.*

#### NORTH DAKOTA.

**Temperature.**—The mean was 1.8 above the normal; maximum, 109, at Medora, 2d and 3d; minimum, 29, at Berlin, 29th; greatest monthly range, 76, at New Salem and Williston; least monthly range, 54, at University.

**Precipitation.**—The average was 0.85 below the normal; greatest monthly, 3.27, at Wahpeton; least monthly, 0.10, at Williston.

**Wind.**—Prevailing direction, northwest.—*W. H. Fallon, Observer, Weather Bureau, Bismarck, director.*

#### OHIO WEATHER AND CROP SERVICE.

**Temperature.**—The mean was 0.7 above the normal; maximum, 101, at Lowell, 26th; minimum, 37, at Wooster, 31st; greatest monthly range, 60, at Coalton; least monthly range, 35, at Cincinnati and Ashland.

**Precipitation.**—The average was 1.03 below the normal; greatest monthly, 6.36, at New Alexandria; least monthly, 0.10, at Piqua.

**Wind.**—Prevailing direction, northwest.—*L. N. Bonham, Columbus, director; C. M. Strong, Observer, Weather Bureau, assistant.*

#### OKLAHOMA.

**Temperature.**—Maximum, 106, at Purcell, 16th; minimum, 45, at Ponca, 28th.

**Precipitation.**—Greatest monthly, 12.55, at Buffalo; least monthly, 0.80, at Ponca.

**Wind.**—Prevailing direction, south.—*J. I. Widmeyer, Observer, Weather Bureau, Oklahoma City, director.*

#### OREGON.

**Temperature.**—The mean was 0.7 above the normal; maximum, 108, at Newbridge, 1st; minimum, 27, at Fife, 15th; greatest monthly range, 68, at Newbridge; least monthly range, 26, at Bandon.

**Precipitation.**—The average was 0.40 below the normal; greatest monthly, 0.63, at Tillamook Rock Light House; least monthly, 0.00, at a majority of stations.

**Wind.**—Prevailing direction, northwest.—*Hon. H. E. Hayes, Master State Grange, Portland, director; B. S. Pague, Local Forecast Official, Weather Bureau, assistant.*

#### PENNSYLVANIA.

**Temperature.**—The mean was normal; maximum, 99, at New Castle, 11th, and at Huntingdon, 18th and 25th; minimum, 30, at State College, 14th; greatest monthly range, 62, at State College; least monthly range, 35, at Philadelphia.

**Precipitation.**—The average was 0.27 above the normal; greatest monthly, 9.99, at Doylestown; least monthly, 1.68, at Lycippus.

**Wind.**—Prevailing direction, northwest.—*Under direction of the Franklin Institute, Philadelphia; W. P. Tatham, director; H. L. Ball, Observer, Weather Bureau, assistant.*

#### SOUTH CAROLINA.

**Temperature.**—Maximum, 97, at Kingstree, 24th; minimum, 57, at Brewer Mine, 14th, at Cheraw, 12th, and at Flint Hill, 17th.

**Precipitation.**—Greatest monthly, 24.67, at Hardeeville; least monthly, 5.13, at Clemson College.—*J. H. Harmon, Observer, Weather Bureau, Columbia, director.*

#### SOUTH DAKOTA.

**Temperature.**—The mean was 1.7 above the normal; maximum, 104, at Ashcroft, Onida, and Oelrichs, 7th, and at Midland, 3d, 7th, and 20th; minimum, 28, at Brookings, 28th; greatest monthly range, 74, at Ashcroft and Onida; least monthly range, 51, at Bear Valley.

**Precipitation.**—The average was 1.00 below the normal; greatest monthly, 2.70, at Yankton; least monthly, 0.18, at Midland.

**Wind.**—Prevailing directions, south and southeast.—*S. W. Glenn, Local Forecast Official, Weather Bureau, Huron, director.*

#### TENNESSEE WEATHER AND CROP SERVICE.

**Temperature.**—The mean was 0.9 above the normal; maximum, 98, at Covington and Dyersburg, 9th; minimum, 50, at Springdale, 8th; greatest monthly range, 46, at Hohenwald and Brownsville; least monthly range, 24, at Lookout Mountain.

**Precipitation.**—The average was 1.10 below the normal; greatest monthly, 11.17, at Riddleton; least monthly, trace, at Jackson, Milan, and Trenton.

**Wind.**—Prevailing direction, south.—*J. B. Marbury, Local Forecast Official, Weather Bureau, Nashville, director.*

#### TEXAS.

**Temperature.**—The mean was 1.0 below the normal; maximum, 110, at Highlands, 2d, and at Sulphur Springs, 1st; minimum, 40, at Coldwater, 30th; greatest monthly range, 66, at College Station; least monthly range, 21, at Galveston.

**Precipitation.**—The average was 0.67 below the normal; greatest monthly, 7.74, at Orange; least monthly, 0.00, at Flower Bluff.

**Wind.**—Prevailing direction, southeast.—*D. D. Bryan, Galveston, director; I. M. Cline, Local Forecast Official, Weather Bureau, assistant.*

#### UTAH.

**Temperature.**—Maximum, 112, at Saint George, 4th; minimum, 25, at Scofield, 24th; greatest monthly range, 70, at Thistle; least monthly range, 43, at Moab.

**Precipitation.**—Greatest monthly, 4.50, at Losee; least monthly, 0.11, at Snowville and Logan.

**Wind.**—Prevailing direction, southwest.—*G. N. Salisbury, Observer, Weather Bureau, Salt Lake City, director.*

#### VIRGINIA.

**Temperature.**—Maximum, 99, at Stephens City, 25th; minimum, 45, at Hot Springs, 15th; greatest monthly range, 49, at Stephens City; least monthly range, 28, at Birdsnest.

**Precipitation.**—Greatest monthly, 8.65, at Christiansburg and Lynchburg; least monthly, 1.52, at Marion.

**Wind.**—Prevailing direction, south.—*Dr. E. A. Craighill, Lynchburg, director; J. N. Ryker, Observer, Weather Bureau, assistant.*

#### WASHINGTON.

**Temperature.**—The mean was 1.2 below the normal; maximum, 102, at Fort Spokane and Walla Walla, 1st, and at Bridgeport, 31st; minimum, 33, at Rosalia, 10th.

**Precipitation.**—The average was 0.45 below the normal; greatest monthly, 1.16, at Aberdeen; least monthly, 0.00, at Bridgeport and Pullman.

**Wind.**—Prevailing direction, west.—*H. F. Alciatore, Observer, Weather Bureau, Olympia, director.*

#### WEST VIRGINIA.

**Temperature.**—Maximum, 98, at New Martinsville, 26th; minimum, 41, at Davis, 2d, 6th, and 8th; greatest monthly range, 51, at Spencer; least monthly range, 31, at Weston and Pleasant Hill.

**Precipitation.**—Greatest monthly, 6.82, at Bluefield; least monthly, 1.76, at Grafton.

**Wind.**—Prevailing direction, west.—*W. W. Dent, Observer, Weather Bureau, Parkersburg, director.*

#### WISCONSIN.

**Temperature.**—The mean was about 1.0 below the normal; maximum, 104, at Osceola, 8th; minimum, 28, at Barron, 29th.

**Precipitation.**—Greatest monthly, 6.00, at Sparta; least monthly, 0.81, at Shawano.—*W. L. Moore, Local Forecast Official, Weather Bureau, Milwaukee, director.*

#### WYOMING.

**Temperature.**—Maximum, 102, at Wheatland, 6th; minimum, 31, at Saratoga, 15th; greatest monthly range, 66, at Sheridan; least monthly range, 45, at Saratoga.

**Precipitation.**—Greatest monthly, 2.24, at Saratoga; least monthly, 0.12, at Sheridan.

**Wind.**—Prevailing direction, northwest.—*E. M. Ravenscraft, Observer, Weather Bureau, Cheyenne, director.*



## GENERAL NOTES. (By the EDITOR.)

## NOMENCLATURE.

The great diversity in the usage of meteorological terms by the daily press and meteorological observers, makes it desirable to state that in the WEATHER REVIEW we shall endeavor to uniformly adhere to the following usages:

The terms "high" and "low" will refer to areas in which barometric pressure is decidedly above or below that of the surrounding country without reference to any normal values and without implying any specific peculiarity as to winds or weather.

The word "storm" will refer to a disturbance of the ordinary average conditions or to unusual phenomena, and unless specifically qualified may include any or all meteorological disturbances, such as wind, rain, snow, hail, thunder, etc. This word may be qualified by some peculiarity, *i. e.*, sandstorm or duststorm, (such as the "simoom"), hot wind (such as the "khamasin" or "fohn" or "chinook"), cold windstorm (such as the "norther" and the "pamperos"), cold rainstorm and snowstorm (such as the "blizzard").

A hurricane or "typhoon" is a large stormy area, often several hundred miles in diameter, within which violent winds circulate around a center. The center of a hurricane or "typhoon" is a comparatively calm region, where even the clouds break away and the rain ceases, whereas the center of a thunderstorm is the region of greatest intensity of wind, rain, or lightning.

A tornado is a very much smaller region, usually less than two miles in diameter, within which even more violent winds prevail. In the typical tornado these violent winds circulate about a central axis, rapidly ascending at the same time and forming a funnel-shaped cloud whose base is at the average cloud level; but many destructive winds have been classed as tornadoes which are not circulating about such a funnel-shaped cloud or vertical axis but which are either blowing straight ahead on the earth's surface, as in the "derecho" or straight line wind, or which have a quasi-rotation around a horizontal axis, as in the blast that accompanies the front of a "norther" or the gust in front of the heavy rain of a thunderstorm. We shall endeavor, as far as possible, to separate the true tornado, which is rare, from the numerous destructive winds, squalls, and gusts which are popularly called tornadoes, hurricanes, cyclones, tourbillons, and other high-sounding names.

The term "whirlwind" is applied to any revolving mass of air, and includes at one extreme the hurricane, and at the other extreme the dust-whirl of our street corners.

A "cyclone" is a mass of air circulating around a center; the lower portion of the air near the earth's surface has a vortice movement in towards a center, while the upper layers have a movement out from a center; the line joining the upper and lower centers is the axis of the cyclone; the direction of rotation is the same in both upper and lower layers; in the northern hemisphere this rotation is said to be in a negative direction, or opposite to the diurnal motion of the sun in azimuth, and opposite to the movement of the hands of a watch lying with its face uppermost.

An "anticyclone" is a mass of air also circulating around a center, but the lower layer of air has a movement out from a center and the direction of rotation is opposite to that of a cyclone, being positive in the northern hemisphere.

The terms "cyclone" and "anticyclone" do not describe phenomena that can be observed by one observer or at a single station, they should, therefore, not be used in the description of local phenomena; they represent generalizations based upon the charting and study of winds and clouds observed at many stations, and should only be used when the nature of the rotation of the winds has been clearly demonstrated or can be safely inferred.

The terms "cyclonic winds," "cyclonic system," and "cyclonic rotation" are equivalent to "cyclone." The outer portion of a cyclone generally has feeble winds and fair weather; therefore a hurricane, tornado, or whirlwind is only a small part of a cyclone.

## METEOROLOGICAL PHENOMENA.

The meteorological phenomena for August have illustrated some interesting principles in the dynamics of the atmosphere, among which the following may be mentioned:

**A.** The general circulation of the atmosphere over America and the Pacific and Atlantic oceans is to be conceived of as essentially consisting of the tropical system of trades below and return-trades above; some of this latter air descends to the earth's surface at the northern limit of the trade-wind region, after which one part of this moves northeastward with the westerly winds of the temperate zone. The descent of these large masses of air is the distinguishing feature of the areas of high pressure that pass over the United States. We must consider this air as not only flowing northward with the anti-trade, but as having some easterly motion left over after leaving the tropical regions. Accordingly, when the air in its slow descent reaches the surface of the earth at latitude 40° to 50°, it has a tendency to move toward the east while the centrifugal force imparted by the rotating earth drives it southward. Thus the prominent characteristic observed on the southeastern border of an area of high pressure consists in the cold, dry, northwesterly wind pushing its way southward and displacing the warm, moist winds at the surface. The phenomena attending the slow downward settling of this air from some moderate elevation in the atmosphere are analogous, no matter whether a very large or a very small horizontal area is involved in the operation. If the horizontal extent be very small and the descent begins at low altitude and the rate of

descent be rapid, then the dynamic warming of the atmosphere may give rise to such phenomena as the fohn, the chinook, and the hot winds of Texas and Kansas. If, however, the horizontal extent be considerable and the descent begins higher up and the rate of descent be slow, then the descending air cools by radiation faster than it warms up by compression, so that we have the ordinary cool, clear atmosphere and deep blue sky of our high areas.

**B.** The horizontal movement that we observe as a westerly wind at the surface of the earth must be considered as the result of the movement of air descending along an inclined path until it strikes and presses down upon and spreads out over the earth's surface; the attending phenomena of pressure and motion can be closely imitated by the flow of water down a gentle slope to the earth's surface. The general motion of the mass of descending air being from the west relative to the earth's surface, it follows that the greater part of the mass continues to flow along the surface from that direction, but a small part is pushed west and north. Since the pressure gradient from the region of highest pressure at sea-level toward the south and east increases the eastward movement, but toward the north and west it diminishes this movement, therefore, on the latter side of the high the winds are light and from the southeast, but on the opposite side they are stronger and from the north-west.

**C.** The rate of descent with time is slower on the south and east side, but more rapid on the north and west side of the high area, consequently the cooling by radiation is less effective on the latter side; therefore, the temperatures at the earth's surface are relatively high on the northwest side and low on the southeast side of the central high. Therefore, the north and west winds on the southeast side being both stronger and cooler under-run the warm air which they displace, producing atmospheric rolls about horizontal axes rather than whirls about vertical axes, and giving rise to local storms characterized by the rapid elevation and mixture of masses of warm air and cold air; sometimes the formation of cloud and rain is so rapid and generous that special ascending currents are formed under the larger cumuli, thus breaking up the continuity of the horizontal roll and introducing here and there violent local whirls on the advancing front of the lower, denser air. These are the characteristic features of the norther and the blizzard of the winter season and of the thunderstorm, tornado, and local rain of the summer season, which latter frequently occur on the fronts of the masses of air flowing out from the areas of descending air. The descending areas do not appear as areas of high pressure on our weather maps unless they are of considerable horizontal extent; when they are small, on the other hand, a self-registering barometer almost always reveals at least a temporary sudden rise, showing that small descending masses have been stopped and had their inertia or kinetic energy converted into pressure by the resistance of the earth's surface.

**D.** The warmer southeasterly winds on the northwest side of the central high pressure rise up gently over the cooler air that lies in front of them, and by a gradual cooling, due to the combined influence of expansion and radiation, they eventually produce the broad areas of general cloud and rain whose buoyancy, due to latent heat and solar radiation, produces an upward suction with its resulting winds and isobars, and develops a region of low pressure. Thus it comes about that the low pressures characterize regions of ascending air and the high pressures characterize descending air, although the extremes observed in areas of high and low pressure could not possibly have been produced by the general circulation of the atmosphere, properly so-called, but only by the concurrent action of both general and special circulations.

**E.** We thus recognize that the numerous local thunderstorms that have occurred in August are illustrations of the rapid and almost adiabatic, dynamic cooling that attends the uplifting of warm, moist air by its semi-rotation about a horizontal axis at the front of an advancing high area; on this basis it has oftentimes been possible to predict their occurrence, both individually and in groups. As a rule, the conflict between the denser air on the west and the lighter air on the east results in pushing the latter northward and the former southward at the immediate line of contact, so that a thunderstorm is preceded by southeast to southwest winds; clear sky or light clouds prevail until the line of conflict is near at hand, then the clouds and their motions show us that the southerly wind is being pushed up, forming a roll or a series of cumulus clouds which then flow off as southwest overflow in the cirrus region. Although this overflow moves from the west or southwest, yet it must not necessarily be considered as a part of the greater westerly current that is about to supervene; it is simply the southeast air raised from the earth's surface and overflowing toward the north in a thin, broad, horizontal sheet; the markings and characteristic forms of the cirri and cirro-cumuli formed in this overflow show that in general it is descending, and that it is thrown into minor waves and whirls by the motions and resistances of the strata immediately above and below it. A short calm follows the south wind and then comes the outflowing surface squall, then the heavy rain or hail, with thunder and lightning under the thickest or tallest and largest cumulus cloud; then comes clear, blue sky with high temperature, revealing the existence of a belt of rapidly descending air, and, after a short time, a dry, cool, west or north-west wind, representing the wave of slowly descending air that is pushing eastward against the southerly wind.

The height of the cumuli and also the amount of rain and hail that comes from them depend upon the relative moisture, temperature, and density of the two masses of opposing air, that is to say, upon the height at which the same density is attained in the two masses. The greater this height, so much

the higher must the easterly air be raised before the western can flow under it, and so much the greater volume of air to be elevated and of cloud and rain to be precipitated.

#### NORTHERS OF VERA CRUZ.

The daily weather maps show that when storms approach the coasts of California, Oregon, and Alaska, the low pressure that belongs to the Bering Sea and the west side of the Rocky Mountains first induces easterly winds and a *high* on the eastern slope of the Rockies, then a *low* develops on the eastern slope to the south of this *high*, and after moving southeast for a while it turns into a northeastward course. Similar analogous phenomena occur when a *low* approaches the western slope of the Appalachian range; we see, first, easterly winds over the Atlantic States, with a slight rise in pressure, then a *low* develops a little farther south; the western *low* fills up while the eastern *low* deepens; the storm-center can not be traced across the mountains, but is properly said to have been transferred from the west side to the east.

Similarly, a hurricane approaching the west coast of Mexico from the Pacific Ocean first induces a norther to descend over Texas and the Gulf. The daily weather maps often show that northers push southward from Texas when pressure is low over Mexico, and that subsequently the norther, by causing a large area of cloud and rain in the southern part of the Gulf, gives opportunity for a cyclonic whirl to originate in that region; evidently, therefore, a storm-center in the Gulf may be either a direct result of the norther, or it may be a transfer of the Pacific storm-center across the Mexican Cordilleras.

It is important for the protection of the United States that we should understand when whirlwinds in the Gulf actually originate in the southern portion of that region as a sequel to a norther, and when they represent those that have existed long before in the Pacific Ocean.

In the northern hemisphere the approach of a storm of any kind, whether hurricane, tornado, thunderstorm, rainstorm, or norther, is generally indicated by the appearance of the horizon, the clouds, and the sky. In the case of the near approach of a hurricane, a thin veil of haze over the whole sky thickens into a milk white sheet, and eventually into a dark gray cloud which Poe has named the "pallium." But if the observer is at a great distance, this pallium appears on the horizon as a pure white homogeneous cloud-bank, which steadily rises in altitude if the storm-center is approaching the observer, or which merely skirts the horizon if the storm is moving past him at a great distance. Similarly, the front of an advancing norther is marked by an advancing cumulus, possibly with light rain surmounted by a small extent of haze or pallium; in front of this are comparatively warm southerly winds and a slight barometric depression; in the rear of the cloud are cold, dry, northerly winds and steadily rising barometer. The approach of an extensive area of rain is often marked by similar appearances. The observer sees at a distance in the west, the northwest, or southwest, low in the horizon, a bank of clouds of a light tint or even white, and whose internal movements (if they can be distinguished) are usually toward his right hand as he looks at the clouds, so that the actual movement is toward the northeast approximately, and he sees that the eastern advance of the cloud line has no direct simple connection with the northeast movement of the individual cloud masses.

These general ideas, which were familiar to us in 1871, and occasionally appear in the earlier press reports and MONTHLY WEATHER REVIEW, are abundantly illustrated by the special studies of Dr. G. Batturoni, of Vera Cruz, who has occupied himself for some time with the study of northers at that place.

According to Batturoni, one often sees to the north of Vera Cruz a sky covered by an arch or veil of clouds rising 5° or 6° above the horizon to the northwest and the northeast, and possibly even to the southeast. This I interpret as apparently showing that the flow of cold air from the north at first passes east of Vera Cruz by reason of the smaller resistance offered by the central Gulf region, and only after a day or two will it extend its influence westward to that port and the adjoining coast of Mexico. Batturoni states that on the occasion of the heavy norther of 1892, Feb. 7-9, he saw the cloud-bank in the north and east on the 8th; the records showed that the norther had begun at Frontera in Tabasco on the morning of the 7th (200 miles east-southeast of Vera Cruz), and that it began at Tampico about 4 a. m. of Feb. 9 (200 miles north-northwest of Vera Cruz), but it did not begin at the latter place until 8.30 a. m. of the 9th. Thus, the cloud-bank gave him, as it were, 36 hours or more notice of the norther.

It would appear from this that a norther may prevail in the central portion of the Gulf of Mexico and southward to Tabasco and westward to Tampico before its front has reached Vera Cruz, which is in the curved part of the coast between these two regions; the front of the norther then slowly closes in and finally reaches Vera Cruz. Apparently the southward flow of the cold air takes place more rapidly down the central portion of the Gulf than along the coast, so that it reaches Frontera, in Tabasco, before it reaches Tampico. Having thus inclosed a region of quiet air between the front of the norther and the Mexican Cordilleras, the denser air can only slowly prevail over the lighter and the farther slow progress of the norther towards Vera Cruz depends upon the rate at which this quiet air can be pushed up and flow away. Batturoni distinguishes two classes of northers:

I. Northers that come from the United States down to Vera Cruz, these have the following characteristics:

(a) The barometer ordinarily falls 0.25, and often 0.30, before the advance of the north wind.

(b) The temperature falls to 66° or even 54°.

(c) The humidity varies from 52° to 68° per cent.

(d) The wind changes from southeast to north, and generally in making this change it veers round through the west.

(e) Three days beforehand, at sunset, the northeast portion of the horizon is of a copper red, which extends through north to west, and the clouds have a peculiar appearance, such that we can be sure of a storm prevailing in the United States on that day or the next, and a norther in Vera Cruz within 48 hours after that.

(f) In the interior of the Mexican coast a cold, persistent rain prevails during the prevalence of the norther on the coast, with a diminishing and weak north wind.

(g) The duration of this class of northers is longer than of the second class.

As an example of this class of northers Batturoni gives that of Feb. 7-9, 1892.

II. The northers that begin and die away on the Gulf coast of Mexico and whose characteristics are—

(a) The sky is invariably perfectly clear and the stars peculiarly brilliant.

(b) The day preceding the norther, the sky is covered by a veil of stratus reaching to within 5° or 6° of the horizon all around us, the mountains on the west of Vera Cruz (e. g., Orizaba and Pirote) still have the summits perfectly clear and the smallest details are visible, but the lower portions are hidden by clouds; to the north of Vera Cruz, or the north-northwest, the low mountains toward the coast are hidden by haze and mist; to the south the mountains are clear up to the very advent of the norther, when they begin to be veiled from top to bottom; from north to east and southeast or south-southeast, the day before the norther, a compact belt of clouds of about 2° in width is formed along the sea horizon and is a certain sign of a norther within 24 hours, the darker and more decided the belt, the stronger will be the wind.

(c) At first the clouds all flow from the southeast, the same as the wind below, but the upper clouds, which are generally cirrus, forming a belt or arch whose summit is in the north or northwest, and very rarely in the east, move very slowly from the northwest.

(d) The southeast wind increases as the norther approaches, and generally veers to the south, whence it blows quite strong, and then backs to the south-east and eventually to the north-northeast, where it settles, or even to the north-northwest if the storm is greatly developed.

(e) The wind begins with a velocity of 8 or 10 miles, and sometimes attains 30 miles or more; it blows without interruption during the first 24 hours, veering during the night to west-northwest and returning the next day about 10 a. m. to the north, repeating the same diurnal variation for a number of days.

(f) Mosquitoes and other insects become more troublesome as the south-east wind continues up to the moment of the bursting of the norther, when they disappear; sea birds seek shelter near the coast.

(g) The barometer sometimes falls 0.2 inch before the norther; at other times it stands below its normal reading 0.10 or 0.15 inch, in which case the norther lasts longer.

(h) The temperature during the two days preceding the norther rises from 81° F. to 88° or 89°, but falls to 70° or 71° as soon as the north wind begins.

(i) The hygrometer shows a relative humidity varying between 64 and 72 per cent during these northers.

(j) As we go back from the coast the weather is fine.

(k) The duration of northers of the second class is less than for the first class.

(l) The fall of temperature attending the second class is less than for the first class.

As illustrating this latter type of northers, Batturoni enumerates the following four cases:

(1) The norther of February 9, 1892, at Vera Cruz: The norther began at 8.30 a. m., or four and a half hours after it struck Tampico, and twenty-six hours after reaching Frontera. He seems to suggest that these northerly winds represent the western side of an advancing cyclone which was formed in the Gulf, and in this case moved from Frontera to Tampico in such a way that the northerly winds did not extend down to Vera Cruz until some time after the center had passed Tampico.

(2) The norther of September, 1892, having a maximum wind velocity of 10 meters per second, or 25 miles per hour: This was felt simultaneously and with the same force at Tampico and Vera Cruz. After twenty-four hours the wind passed to the west, and similarly every night for eight days, returning to the north about 9 or 10 o'clock every morning. It blew with a velocity of 8, 6, and 4 meters, successively, until it became very feeble, but frequently increasing and always threatening to become very violent again.

(3) The norther of September 23-25, 1892, he thinks may not have been felt at the American ports. This norther began at Tampico September 25, 11 a. m. The bad weather commenced at Vera Cruz on the 24th and lasted until the 27th; the maximum wind was on the 25th, lasting more than six hours, the winds always blowing in whirls.

In the southern part of Mexico, even in Oaxaca, on the south side of the plateau of the Mexican Cordilleras, the wind was terrible and disastrous. Batturoni says it was a true cyclone as to violence and nature.

He also says that at Pachuca it was a true hurricane. [Apparently he uses the words "cyclone" and "hurricane" to indicate the violence of the wind, and not in a strictly technical sense.]

Batturoni gives a diagram of this storm, which, however, seems only to indi-



cate the fact that some sort of whirling, gusty squalls prevailed for 100 miles off the coast from Tampico to Tuxtla (and inward to Pachuca, latitude  $20^{\circ} 2'$ , longitude  $98^{\circ} 6'$ , a little north of the City of Mexico), and to Vallenacional (in the northern part of Oaxaca, latitude  $17^{\circ} 9'$ , longitude  $19^{\circ} 1'$ , but still on the northern edge of the Mexican Cordilleras). In general there is no evidence that this storm passed over the mountains and down the Pacific slope.

(4) On July 11, 1893, Batturoni writes that the "cyclone of July 7th, in Iowa [he means the tornado of July 6th] was followed by violent wind, rain, and lightning on the 8th at Vera Cruz. The storm came first from the south, then southeast, then north, then northwest, and prevailed simultaneously to the south-southeast and northwest of the station. Rain continued until 5 a. m. of the 11th; the rainfall was 2.42 from 1 a. m. to 5 a. m., with north wind

and lightning. The rainfall from the evening of the 8th till 6 a. m. of the 11th exceeded 9 inches."

"On the 9th, at 10 a. m., he announced that the storm at Vera Cruz was a consequence of a cyclone in the region between Nevada, Nebraska, and Texas, and subsequently learned of the tornado near Des Moines, Iowa."

The presence of the typical cloud, of which he had spoken before, and which remained persistently in the horizon at the northwest one-quarter west, enabled him to foretell the weather (violent north wind with rain) two or three days in advance. He concludes that that cloud is coincident with the American cyclones [tornadoes] north of the Mexican frontier. The storm was also felt severely for a distance of 100 miles around Vera Cruz. The barometer was low for two or three days before the storm, but the temperature did not rise.

## PROCEEDINGS OF THE METEOROLOGICAL CONGRESS HELD AT CHICAGO AUGUST 21-24, 1893.

(By OLIVER L. FASSIG, Secretary.)

Monday, August 21, at 10 a. m. the congresses of the Department of Science and Philosophy of the Congress Auxiliary of the Columbian Exposition were formally opened at the Memorial Art Institute of Chicago with an address of welcome by the President, Mr. C. C. Bonney, followed by responses from representatives of the various special congresses. At the close of this general session the different divisions met in rooms assigned to them, the Division of Meteorology, Climatology, and Terrestrial Magnetism meeting in room XXXI, in which the regular sessions were held daily from 10 a. m. to 2 p. m. from August 21 to August 24.

The chairman of the congress not being able to be present in person the first day, Prof. F. H. Bigelow, representing Prof. Mark W. Harrington, opened the session at 11 a. m. of the 21st with a few words of welcome and a statement of the objects of the congress.

The congress had no legislative authority. The main purpose, as previously announced, was to collect together a series of memoirs "outlining the progress and summarizing the present state of our knowledge of the subjects treated," and to print them in full in the English language.

The meetings, while thus making the reading and discussion of papers a matter of secondary importance, were by no means lacking in interest or profit to those who were present. But few of the papers could be read in full, owing to their great number and the absence of many of the authors. In all about 130 papers were read by title, in abstract or in full, forming a most valuable collection of memoirs prepared by writers of authority in their respective lines of research.

Among so many papers of merit, a simple list of which would occupy several pages, individual mention can not be fairly attempted.

While the papers were read in general session, they were assigned, in the printed program, to various sections according to the subject, each section being placed in charge of a responsible chairman.

Section A, Prof. C. A. Schott, U. S. Coast Survey, and Mr. H. H. Clayton, U. S. Weather Bureau, chairmen. The papers of this section are devoted to instruments, their history and relative merits, and to methods of observation, especially to methods of observing in the upper air.

Section B, Prof. Cleveland Abbe, U. S. Weather Bureau, chairman. This section is the most extensive in its scope, dealing mostly with questions in dynamic meteorology; much attention is given to the study of thunderstorm phenomena in various countries.

Section C, Prof. F. E. Nipher, Washington University, chairman, comprises a series of sketches of the climate of different portions of the globe.

Section D, Major H. H. C. Dunwoody, U. S. Army, chairman, is devoted to the discussion of the relation of the various climatic elements to plant and animal life.

Section E, Lieut. W. H. Beehler, U. S. Hydrographic Office, chairman, deals with questions relating to marine meteorology, particularly to ocean storms and their prediction, methods of observation at sea, and international co-operation. During the reading of a paper on the work of the Hydrographic Office of the Navy, Lieut. Beehler had on exhibition a fine bust of Lieut. Maury by the sculptor Valentine, of Richmond, Va.

Section F, Prof. Charles Carpmal, Director of the Canadian Meteorological Service, and Mr. A. Lawrence Rotch, Director of the Blue Hill Observatory, chairmen, comprises papers relating to the improvement of weather services and especially to the progress of weather forecasting.

Section G, Prof. F. H. Bigelow, U. S. Weather Bureau, chairman, deals with problems of atmospheric electricity and terrestrial magnetism and their cosmical relations.

Section H, Prof. Thomas Russell, of the U. S. Lake Survey, chairman, has to do with rivers and the prediction of floods.

Section I, Oliver L. Fassig, Librarian U. S. Weather Bureau, chairman, is devoted to historical papers and to bibliography, with special reference to the history of meteorology in the United States.

Prof. Mark W. Harrington, Prof. F. H. Bigelow, Capt. P. Pinheiro, of Rio Janeiro, and Lieut. W. H. Beehler successively presided over the meetings. The printed program distributed at the sessions of the congress contains a list of all papers presented. Copies of this may be obtained from the secretary upon application.

At the close of the last session a resolution was offered calling for recommendations by the congress relating to (a) international co-operation in observations of auroras, (b) simultaneous (Greenwich noon) observations daily at all stations on land and sea, in addition to observations at other times, (c) investigation of the earth's magnetic polar current and the exact determination of the solar rotation. As the congress had no legislative authority, it was agreed to hold a special session for the consideration of these questions after adjournment, on the following day.

Preparations have been begun for the printing of the papers, and an effort will be made to complete the work at an early date.

# PROCEEDINGS OF THE SECOND ANNUAL CONVENTION OF THE AMERICAN ASSOCIATION OF STATE WEATHER SERVICES, WITH BRIEF REFERENCE TO FORMER CONVENTIONS.

JAMES BERRY, Secretary.

During the latter part of 1885 the Chief Signal Officer issued a letter to interested parties, suggesting a convention of the directors of the State weather service organizations existing at that time. The suggestion was favorably received and a very profitable conference was held at the Smithsonian Institution in Washington City on February 24 and 25, 1886. No further meeting of the directors of State weather services was held until the summer of 1892, when, at the suggestion of the present Chief of the Weather Bureau, arrangements were made for a convention to be held August 15 and 16 in Rochester, N. Y., in connection with the meeting of the American Association for the Advancement of Science. At this second convention of State weather service directors, at which eighteen State services were represented, a permanent organization, known as the American Association of State Weather Services, was effected, and the results of the meeting were most encouraging. The proceedings of the convention formed a very interesting publication, which was issued as the "Report of the First Annual Meeting of the American Association of State Weather Services."

On August 1, 1893, the following letter announcing the date of the Second Annual Convention of the American Association of State Weather Services, with list of topics for discussion, was addressed to the directors of the several State weather services by Major H. H. C. Dunwoody, the president of the association:

SIR: After consultation with the Chief of the Weather Bureau it has been decided best to hold the convention of the American Association of State Weather Services for 1893 in Chicago (not at Madison, Wis., as was expected) at the time and place of the meeting of the Meteorological Congress at the Art Palace of Chicago, Lake front, foot of Adams street, in that city, August 21-25, 1893.

## TOPICS FOR DISCUSSION AT THE MEETING OF THE AMERICAN ASSOCIATION OF STATE WEATHER SERVICES TO BE HELD IN CHICAGO, ILL., AUGUST 21-25, 1893.

1. Inspection of stations of observation and display stations annually, to form the acquaintance of the observers and displaymen and to instruct and encourage them in their work.
  - (a) Importance of location of instruments, and elevation of instrument-shelter above ground.
  - (b) Instruments and shelters to be supplied by the Weather Bureau.
2. The necessity for sufficient weather-crop correspondents to make the data in weekly weather-crop bulletins thoroughly reliable.
  - (a) Time of day of issue of the weekly bulletins. Should they not be issued Tuesday afternoon, and is it not advisable to manifold sufficient copies for the press of the State by means of the milligraph process.
  - (b) The best method of printing the weekly bulletin, and at whose expense.
3. Uniformity in method and class of data published weekly and monthly.
4. Importance of directors and assistants in charge making a special study of the crops grown in the State. Since the majority of States have experimental stations, and that these stations are also voluntary stations, should not the date of inspection of such stations be prolonged to several days so as to give the student time to learn the important details connected with the growth of the several crops, etc.
5. Value of an annual convention of the voluntary observers, displaymen, and weather-crop correspondents in each State—some State Fair day, or at such time when the people of the State are drawn together.
6. Is the work of the director or assistant in charge of a State service of such magnitude as to make his duties as local forecast official or observer in charge of station too onerous to give him the time to do as well for his service as he could do if he had only the duties of director.
7. Relation of State weather services to experimental stations, and what will improve them.
8. The necessity for more accurate measurement of snowfall.
9. The value of frost predictions and the best method of making them locally.
10. Methods of protecting tender crops from frost.

In pursuance of the above call the convention met in Chicago on the dates named, and the following is a report of its proceedings:

## First session.

The convention was called to order by Vice President Pague, of Oregon, at 11 a. m., August 21, in Hall 30.

On motion, the convention adjourned until 10 a. m., 22d, owing to the absence of the Chief of the Weather Bureau, the President of the Association, and other members.

## Second session.

Convention called to order by Vice President Pague. Members present: Prof. M. W. Harrington; Messrs. Clarke, Arkansas; Craig, Illinois; Sage and Chappel, Iowa; Jennings, Kansas; Burke, Kentucky; Kerkam, Louisiana; Hyatt, Mississippi; Evans and Conger, Michigan; McNally, Missouri; Loveland, Nebraska; Turner, New York; Strong, Ohio; Widmeyer, Oklahoma; Pague, Oregon; Ball, Pennsylvania; Doherty, South Dakota; Harmon, South Carolina; Salisbury, Utah; Ryker, Virginia; and Moore, Wisconsin, with Messrs. Wilson, Memphis; Clayton, Boston; and Frank- enfield, Chicago, as visitors.

The following letter from the absent President of the Association was read:

TO THE AMERICAN ASSOCIATION OF STATE WEATHER SERVICES:

GENTLEMEN: It is hardly necessary for me to say how much I regret my inability to be present with you on the occasion of the second annual meeting of the association; having in mind the reunion of last year when I had the pleasure of being with you personally, and taking part in discussions which, I am able to say, resulted in much benefit not only to the State services but to the individual members of the association as well. It is, therefore, a source of regret to me that my official duties render impossible my attendance at the Chicago meeting. My interest in the success of these State services increases with their growth, realizing as I do the close relation they bear to the National Service, and the means which they afford for increasing its benefits to the public.

The association may justly regard with pride and satisfaction the operations of the past year, since they mark the most successful period since the organization of the State weather services. For these gratifying results we are indebted to the present Chief of the U. S. Weather Bureau, Prof. Mark W. Harrington. His high appreciation of this branch of meteorological work, his clear insight into the capabilities of these State services co-operating with the National Service, and the generous support which he has uniformly given them have been potent factors in increasing the value of this work. Without the aid of the Bureau over which he has the honor to preside, many of the State services now successfully operated could not be maintained.

When our association last adjourned it was with the expectation that the following meeting would be held at Chicago. Although preliminary arrangements were made for meeting at Madison, Wis., after consultation with the Chief of the Weather Bureau, I assumed the responsibility of calling the association to meet in conjunction with the Meteorological Congress, and I am convinced that this change will result in a more satisfactory meeting. It will also enable the attending members to avail themselves of the advantages of the discussions bearing upon the science of meteorology, which discussions must prove of great value to them in the prosecution of their work.

In preparing the topics for discussion, I have again received valuable suggestions from the Chief of the National Bureau, and I have extended the list of topics to include discussions upon the relations of the State services to experimental stations; the value of frost warnings, and the methods of protecting tender crops from frosts. The full discussion of these latter subjects is particularly desirable, as a more perfect understanding of them will increase the field of usefulness of the National Service.

To the subjects announced in the list of topics for discussion, it might be well to add one relative to the distribution of forecasts as at present operated. During a recent visit in central New York, I observed several stations where the forecasts are regularly received by telegraph. I found that the absence of a telegram (which we all understand to mean "fair and stationary") was an indication to the observer that he should not display flags; at least the flags were displayed only when the change from "fair" to "rain," or "local rain" was announced. A question, therefore, is: Would it not be better to send the message daily without regard to conditions, and thus keep up interest in the service? These omissions of the telegraphic message are likely to cause great carelessness in the general displays. This is the impression I received from the observer in charge of the New York service, independently of the local stations visited by me.



I deem it proper also to invite the attention of the association to the annual report of the Chief of the Weather Bureau for last year, which contains extracts from the report of the Secretary of Agriculture. Here may be found a general view of the weather conditions, as noted from week to week in each State during the season. Observers in charge of the State weather services have been requested to continue this summary for the current season, with a view to its publication in the Secretary's report, thus securing the distribution of 400,000 copies of a reliable reference to seasonal conditions as they occur from year to year, the idea being to continue this feature as a part of the annual report of the Department of Agriculture. The weather crop services of the country depend upon the organization which you represent, and the public's appreciation of these services is increasing from year to year. Effort should be made, therefore, to place this information in such form as to secure for it the widest possible distribution.

While the crop service is the most appreciated, yet there are other valuable features of these organizations that should not be overlooked. These organizations are also to assist in the rapid distribution of forecasts and cold-wave warnings. That this branch of the work may be extended, each chief of service should ascertain the localities in his State wherein these warnings may be most useful, and efforts should be made to secure special facilities for the distribution of the information over threatened districts. As so much depends upon the character of the meteorological data collected, attention should be given to the exposure of instruments; they should be inspected when practicable and the local observers instructed in the proper use of them.

In conclusion, I desire to thank the association for, and express my high appreciation of, the honor conferred upon me at the last meeting by selecting me for your first president. In relinquishing the office it is my wish to reassure the members of the association that the interest which I have felt in these State weather services since my first suggestion for their organization shall continue.

Again expressing my regret that I must forego the pleasure of attending the Chicago meeting.

I am, very truly, yours,

H. H. C. DUNWOODY.

WASHINGTON, D. C., August 19, 1893.

The Chairman called attention to the necessity for the election of officers, but on motion such election was deferred until the close of the meeting.

Secretary Kerkam desired the assistance of a member to act as temporary secretary, and Mr. McNally was elected to the office for the session.

The first subject for consideration was the "Inspection of stations of observation and display stations annually, to form the acquaintance of the observers and displaymen and to instruct and encourage them in their work." This was discussed by Messrs. Jennings, Moore, Clarke, Salisbury, Evans, and Conger, and the cost of such inspections in the different States and Territories was estimated at from \$100 to \$150 per annum, the discussion leading to the adoption of the following resolution:

*Resolved*, That it is the sense of this convention that the sum of \$100 be annually allotted by the National Weather Bureau to each State weather service for the purpose of inspection.

The importance of location of instruments and elevation of instrument shelters above ground, and supplying instrument shelters and instruments, was freely discussed. Resolutions covering the furnishing of instruments and shelters were prepared, and it was the sense of the convention that the elevation of the bottom of shelters should be  $4\frac{1}{2}$  feet above the ground. Mr. Pague of Oregon detailed at length experiments that he had made with varying exposures at different heights, and he too found that the  $4\frac{1}{2}$  foot elevation gave results varying but slightly from those of other elevations that had been used by voluntary observers of the Oregon service.

The following resolution, by Mr. Salisbury of Utah, was adopted:

*Resolved*, That instruments and shelters should be supplied to voluntary stations by the U. S. Weather Bureau, and that when so supplied the installation should be done by the director or assistant director, and that the necessary expenses of such establishment of stations should be paid by the National Service; said establishment being considered a part of the annual inspection of voluntary stations.

Upon invitation of Prof. Harrington to members of the association to visit the Meteorological Congress in session in the same building to listen to papers to be read that bore

directly upon state weather service work, the convention adjourned until 2 p. m.

### Third session.

The convention was called to order by the First Vice President, but no quorum being present, adjourned to 10 a. m. of the 23d.

### Fourth session.

Convention called to order by Vice President Pague at 10 a. m. 23d. The minutes of the preceding meeting were read and approved. Messrs. Salisbury, Burke, and Evans were appointed a committee on resolutions.

The second subject, "The necessity for sufficient weather-crop correspondents to make the data in weekly weather-crop bulletins thoroughly reliable," was then taken up.

Mr. Kerkam was of the opinion that each county should have at least five weather-crop correspondents, one of whom should be the voluntary observer, who would furnish the meteorological data in detail. He stated that there was no lack of correspondents to be had, provided there was a co-operation between the State agricultural society and the State weather service; that he had some 600 available to call upon at all times who would render reports, but that only about 300 were necessary to give five to a parish or county in Louisiana.

Messrs. Pague and Jennings entered into the discussion, and Mr. Chappel stated that the reporters of the Iowa service were principally farmers, and that he had some 1,200. Mr. Sage, also of Iowa, said that he had three classes of reporters, the voluntary observers, rainfall reporters, and the regular crop reporters; he preferred having 100 weekly reports to 200, and 500 monthly crop reports to 1,000 or more, since he could better digest the reports when there were not so many. Messrs. Salisbury and Craig spoke, and Mr. Clarke suggested publishing the individual county reports in the weekly bulletins; he said he had from 190 to 215 weekly reports and found no trouble in compiling them into a bulletin.

Mr. Kerkam asked about the number of weather-crop reporters required to give best results. Mr. Moore thought 100 would be sufficient. Mr. Clarke differed, and thought more were needful, and as many as could be handled. Mr. Jennings placed the number at 250, and advocated the distribution of charts in order to secure the several kinds of data desired. Mr. Evans deemed it advisable to have at least 400 reporters, and stated that he experienced but little trouble in compiling data. Mr. Strong was opposed to limiting the number, stating that he had 1,263 correspondents in Ohio, and that he received about 1,000 reports each week. Mr. Salisbury spoke at some length upon this subject, and Messrs. Ball, Clarke, and Moore offered the suggestion of having as many as could be handled intelligently.

Mr. Clarke, Arkansas, here offered the following resolution, which was adopted:

*Resolved*, That it is the sense of this meeting that the number of crop correspondents in the various States and Territories be left to the judgment of the directors of said services; but it is desirable that a sufficient number (100 or more) should be obtained to give accurate crop conditions.

As to time of issuing weather-crop bulletins, Mr. Sage expressed himself unfavorably towards Tuesday, claiming that as the worst day of the week; on the contrary, Messrs. Kerkam, Moore, Clarke, McNally, and Ball considered Tuesday decidedly the best day of the week for that character of reports, and Mr. Ball considered Monday an admirable day for grangers' bulletins.

The following resolution by Mr Sage was adopted:

*Resolved*, That it is the sense of this convention that authority should be given to directors of State services to issue and mail weekly crop bulletins on Monday evenings, where in their judgment a wider dissemination could thereby be secured.

Messrs. McNally and Jennings were strongly in favor of having a printer and press at each station, in order that the reports might be issued in good shape. Mr. Sage thought each State should provide the necessary funds for such work.

Mr. Ryker offered the following resolution, which was adopted:

*Resolved*, That the National Weather Bureau should provide for the printing of the weekly weather-crop bulletins in those States and Territories that do not provide for such printing.

The third subject for discussion, "Uniformity in method and class of data published weekly and monthly," next occupied the attention of the assemblage.

The fourth subject, "Importance of directors and assistants in charge making a special study of the crops grown in the State. Since the majority of States have experimental stations, and that these stations are also voluntary stations, should not the time devoted to inspection of such stations cover several days so as to give the student opportunity to learn the important details connected with the growth of the several crops, etc.," was discussed at length by Messrs. Evans, Ball, Clarke, and others, leading to the following resolution (by Mr. Moore), which was adopted:

*Resolved*, That the State director should, by visiting the experimental stations, thoroughly familiarize himself with the cultivation of crops which are especial features of his State.

The fifth subject, "Value of an annual convention of the voluntary observers, displaymen, and weather-crop correspondents in each State, some State Fair day or at such time when the people of the State are drawn together," was admitted to be an excellent thing in those States where such fairs are held.

Mr. Moore of Wisconsin here moved that Mr. C. E. Linney, of Milwaukee, be elected to membership in the association, which motion was carried.

The sixth subject, "Is the work of the director or assistant in charge of a State service of such magnitude as to make his duties as local forecast official or observer in charge of station too onerous to give him the time to do as well for his service as he could do if he had only the duties of director," was next taken under discussion. Mr. Jennings was of opinion that the director should be relieved from station work so as to enable him to visit extensively throughout the State. Mr. Salisbury expressed himself as favoring a release from the duties of observer when the responsibility of director rested on him. Mr. Moore held an opposite opinion, believing the best results were obtainable where the two positions were combined. Mr. Ryker concurred. Messrs. Kerkam and Clarke preferred combining the two positions, but Mr. Evans said he thought the two would conflict, and that one man could not acceptably fill both.

Mr. Moore of Wisconsin offered the following resolution, which was adopted:

*Resolved*, That State weather services are so differently constituted that it would be impracticable to apply the same rules to all; and that the local exigencies of each case should determine whether the local forecast official and director should be one and the same person.

The seventh subject, "Relation of State weather services to experimental stations, and what will improve them," was next brought up and fully discussed by Messrs. Clarke, Pague, and others. Mr. Sage stated that the work had been proposed in Iowa, and some co-operation secured, and he approved the united action. Mr. Turner stated that the New York State weather service had furnished samples of diseased vegetation to agricultural experimental stations. In Kansas and Kentucky there has been some co-operation, and Mr. Burke of the latter State said that it had proved very advantageous. Mr. Conger, however, was not in favor of the detail of an observer at experimental stations, and said that the

observations had not been properly taken when the instruments only had been furnished. The policy of the Government was opposed to extending aid to the co-operation of the services, a sentiment readily indorsed by Mr. Moore. Mr. Craig remarked that he was opposed to furnishing instruments, believing that they did not receive proper care. Mr. Ryker stated that in Virginia the experimental station furnished the poorest and most unreliable reports. Mr. Conger said that the records of the State central office could be used at the experimental stations for the purpose of determining the climatic conditions favorable for vegetation. Mr. McNally stated that his observers at experimental stations were very good, with the exception of a few months, when they were absent from station, and Mr. Pague said that in Oregon the reports were good from experimental stations.

Motion was here made by Mr. Craig that the meeting adjourn, seconded by Mr. Ryker, which, when put to a vote, was lost.

The eighth subject, "The necessity for more accurate measurement of snowfall," occupied considerable attention, Mr. Turner, of New York, discussing the subject very fully. Mr. Craig stated that the best method of measuring was to invert the funnel and collect the amount underneath, but Mr. Jennings was of the opinion that there was no accurate means of measuring snow.

The ninth subject, "The value of frost predictions and the best method of making them locally," was next presented to the convention, and Mr. Burke explained and discussed the methods used in Kentucky. Mr. Moore inquired what means of protection had been made, to which Mr. Burke replied that as yet no means had been tried. Mr. Moore stated that no protection, except for cranberries, had been made in Wisconsin; that water will protect cranberries from even a freezing temperature—local forecast officials should consider the condition of soil in making frost predictions.

The tenth subject, "Methods of protecting tender crops from frost," served as a topic for lengthy debate. Mr. Moore again advocated the means of flooding the cranberries for protection. Mr. Conger stated that in Alabama he had noted that the use of lumber was successful. Mr. Pague said that in Oregon mountain fires were a means of protection during the early autumn.

The following paper on "Frost predictions," by Mr. C. E. Linney, Milwaukee, Wis., was presented and read by Mr. Moore:

#### THE VALUE OF FROST PREDICTIONS AND THE BEST METHOD OF MAKING THEM LOCALLY.

Throughout all the States of the Union, the danger of late frosts in the spring and early frosts in the autumn has materially interfered with agriculture, and especially with horticulture. A series of frost charts which have been prepared from the data of the Bureau show, approximately, the dates of the first and last killing frost, from which it would appear that even the extreme Southern States are subject to severe frosts in the spring until March 1st; the Middle States from that date until May 1st, and the northern border line may catch a frost from that date until June 1st of sufficient severity to blast a crop just starting. While in the autumn the Northern States are subject to killing frosts by September 1st, the Middle States from that date to October 15th, and southward, leading out to the extreme southern border, frosts are liable to occur by December 1st. Even the central portion of Florida is not secure after December 15th.

The damage resulting from a severe and general frost, even over but a couple of the States of the Union, is best shown in the marked hesitation of growers to attempt early and tender crops, although always the most profitable, through fear of repeated losses in the same line and through the same cause. The loss in money value is difficult to ascertain, but it is without doubt represented by hundreds of thousands of dollars every growing season. And the danger is not over after the seeding and cultivating season is passed, for even then an early frost in the autumn will quite surely lay waste a summer's work, as would that of the spring a spring's work. In the case also of many plants, especially fruits, the damage is not restricted to one season or to the season at hand, but blasts the crop of the coming year and lends discouragement to the future.

In an agricultural country, such as the United States must largely be, and located as we are with a vast cold-wave producing region to the north of us,



from which flow most of the prevailing winds of late winter, early spring, and fall, the need of more careful and accurate investigation of frosts is at once apparent. A comprehensive and thorough investigation of their occurrence, the damage done, and the discovery of some means of mitigating their severity, together with an accurate and timely forecast, is imperative.

Frost in a general sense means a lowering of the temperature to 32°, but as applied to agriculture, especially as to temperature which will injure tender vegetation, a temperature much above freezing will too often, under favorable circumstances, cause material damage or wholly ruin the crop. A frost is largely the result of radiation, and the moisture which is deposited is a solid, supposed to be formed at the moment of deposition, and hence is not dew, although the two are closely allied, and a night favorable to dew, with slightly lower temperature, would also be favorable to frost. If, however, the temperature fall slightly lower and a frost occur without the white deposit, then the frost is a black one, and much greater damage will result. White frost will probably be deposited under favorable circumstances (clear sky, quiet air, a sandy soil, and the barometer above the normal or rising after the passage of a low) with the temperature as high as 45°—Lieut. Allen says 47°. And frost is to be expected if the temperature fall to or below 40°, with heavy frost at 36°. Hence it is a common occurrence for a light frost to be reported in Wisconsin when the Weather Bureau stations surrounding do not report a temperature below 45° to 50°, and often when the reported temperatures are above 50°; a fact which indicates most clearly the necessity of country air readings as a guide to an accurate knowledge of the temperature to which crops are exposed. This same fact is also, in a way, proof of the radiation theory of frost, since the murky, smoky, heated air of the towns and cities will often resist the approach of frost while the country around is subjected to severe frost.

As radiation is the cause of frost and the rapid cooling of the plant results in its own death, it follows that anything which will retard this radiation will in many cases entirely overcome the frost deposit. Clouds accordingly prove good protection; thick banks of smoke answer the same purpose; and light frames with canvas drawn over the plants save them night after night. In Wisconsin the plan of smudging in those parts of the State largely devoted to tobacco raising has been little practiced, but with cranberry growers the well known flooding process affords ample protection as long as the reservoirs have water.

A suggestion might not be out of place: An interesting and valuable series of observations could be instituted if temperature readings were taken at hourly intervals at various elevations from the surface of the ground upward to a height of 8 to 10 feet—the elevation at present recommended for the Weather Bureau instrument shelters. I am informed by reliable men who have carried on a limited series of observations that a difference of 10° to 15° is frequently found to exist over the cranberry bogs and on sandy soil between the surface and above the elevations. It will, therefore, be readily seen that the present system of city and elevated readings is very faulty in frost predictions. Until a complete and correct system of deductions has been made showing the occurrence of frosts with the temperatures reported by the Weather Bureau station, the present system of forecasts must be largely or entirely a matter of individual estimation and guessing.

The hygrometer system of frost predictions is undoubtedly the one to be most generally recommended to the individual observer, and, once he is familiar with the ordinary clearing weather and wind signs of his section, he can, by the aid of the wet and dry bulb, form a fairly accurate idea of what minimum temperature to expect during the night.

The remarkable rapidity with which cold-air currents will seek the lower levels and fill the valleys as the frost season approaches is a matter of no little moment, and could some system be devised to secure the intermingling of the warmer upper strata and hill temperatures with those which have poured into the valleys through air drainage, and which too often carry with them frosts which the uplands escape, the result would no doubt prove to be beneficial, and a frost would frequently be diverted which would otherwise prove destructive to vegetation.

The charted conditions which give frosts to the country are similar in many respects to the more severe frost periods which the cold waves of winter bring. The dry, calm, clearing air of the high pressure area or the rising barometer after the passage of a low, the down flow of upper currents, the drawing in of the lower temperatures of the north and northwest, and the corresponding rapid and regular approach of the frost line from the northwest to the south, southeast, and east are but a reproduction on a milder plan of the cold wave of the winter. Lieut. Woodruff, in a series of interesting tables on the progress of cold waves, has shown that of all cold waves that reach central North Dakota from Montana 71 per cent of them arrive in eight hours and 98 per cent in twenty-four hours; 73 per cent reach Saint Paul inside of twenty-four hours and 91 per cent inside of thirty-two hours; 88 per cent reach Omaha inside of twenty-four hours and 96 per cent inside of thirty-two hours; 56 per cent reach Chicago inside of twenty-four hours, 72 per cent inside of thirty-two hours, and 93 per cent inside of forty-eight hours; 53 per cent reach Saint Louis inside of twenty-four hours, 77 per cent inside of thirty-two hours, and 95 per cent inside of forty-eight hours; 53 per cent reach Buffalo inside of thirty-two hours, 80 per cent inside of forty-eight hours, and 96 per cent inside of sixty-four hours; and, finally, that 46 per cent reach Washington inside of forty hours, 58 per cent inside of forty-eight hours, 71 per cent inside of fifty-six hours, and 88 per cent inside of seventy-two hours, from which it would appear, allowing a reasonable difference for the slow progress of frost-bearing winds, that twenty-four to thirty-six hours would include

much of the north, west, and central portions of the country in an advancing frost wave, and that that portion remaining untouched at the end of thirty-six hours, except the season be well advanced and freezing temperatures general, would not be touched by the frost wave, other weather conditions having overcome the cold.

The following examples of successful frost predictions by Mr. Moore may be of interest: the frost of August 22-23, 1891. On the morning of August 21st a low area was central in the upper Saint Lawrence Valley, a high area of 30.4 inches was central in the Northwest Territory and Montana. Fresh westerly winds were flowing out over all of the western country, and the following temperatures (minimums) were reported: Fort Buford, 42°; Bismarck, 50°; Moorhead, 52°; Milwaukee, 60°, and the other bordering stations, including Saint Paul, Duluth, Marquette, La Crosse, and Green Bay, 58°. On the morning of the 22d the high barometer covered the entire western country with two centers, one over Wyoming and Colorado and the other over northeast Montana. Fresh northwest winds and clear weather prevailed over Wisconsin, except at Saint Paul and La Crosse, where the weather was cloudy. The temperatures reported were: Bismarck, 44°; Huron, 40°; Moorhead, 38°; Saint Paul, 46°; Duluth, 46°; La Crosse, 48°; Marquette, 48°; Green Bay, 50°; and Milwaukee, 56°. Severe frosts were predicted to occur that night. On the morning of the 23d the center of the high barometer was over the Missouri Valley, and extended south from South Dakota and western Minnesota. The weather was cloudy along the east shore, otherwise clear; winds light to fresh from the north, with the following temperatures: Bismarck, 36°; Moorhead, 34°; Huron, 34°; Saint Paul, 42°; Duluth, 44°; Marquette, 50°; La Crosse, 42°; Green Bay, 48°; and Milwaukee, 53°. Light showers had occurred over the entire State in the twenty-four hours previous. Nevertheless frosts were general over the State, and the Dakotas and Minnesota had very severe frosts. The synopsis on the morning map of the 24th says: "Great damage is reported to tobacco and cranberries by frosts in Wisconsin. These frosts were forecasted by the Milwaukee office on Friday morning and warnings were sent to fully one hundred points in the State, stating that light frosts would occur Saturday the 22d, and severe frosts Sunday (23d) morning."

The frosts of August 27-28, 1891: On the morning map of the 26th (Wednesday) a low area was central over the east point of Lake Superior, and cloudy weather and fresh westerly winds prevailed over Wisconsin. High barometer was developing over Montana. Temperatures reported by the stations were 44° at Bismarck, 42° at Moorhead, 42° at Huron, 38° at Fort Buford, 46° at Custer, 50° at Duluth, 52° at Saint Paul, 58° at La Crosse, 56° at Marquette, 60° at Green Bay and Milwaukee. The morning forecast read as follows: "For Wisconsin, fair this afternoon and Thursday. Light frosts are indicated to-night, particularly in north portion. Heavy frosts Thursday night. Northwest winds." On the morning of the 27th (Thursday) the high barometer covered the entire country to the west of the Mississippi, with center over Nebraska, 30.4. The weather was cloudy over the east and south portions of Wisconsin, balance clear, wind fresh northerly. Temperatures reported were: Bismarck, 36°, killing frost; Huron, 40°; Moorhead, 42°; Saint Paul, 46°; Duluth, 48°; La Crosse, 50°; Marquette, 50°; Green Bay, 56°; and Milwaukee, 58°.

Light frosts occurred in all north and northwest counties. The forecast for that day read: "For Wisconsin, fair and slightly cooler to-day and until Friday evening, with northwest winds; frosts to-night." On the morning of the 28th (Friday) the high barometer was central over the middle Mississippi valley and two low areas appeared, one in the Saint Lawrence Valley and the other over Manitoba. The weather over Wisconsin was partly cloudy, with the wind light and variable. Temperatures reported were: Moorhead, 44°; Duluth, Saint Paul, Marquette, and Green Bay, 40°; La Crosse, 38°; and Milwaukee, 48°. The following extract from the morning synopsis explains the situation: "The lowest temperatures anywhere this morning were in Wisconsin and over the Lake Superior country. Frosts occurred last night in the tobacco and cranberry regions of the State, and light frosts were even observed in the country about Milwaukee. Wednesday (the 26th) the Milwaukee office sent warnings throughout the State forecasting this frost. The lowest temperatures of the season in Wisconsin were recorded, as follows: La Crosse, 38°; Milwaukee, 47°; Green Bay, 44°; and Duluth, 24°." It must be remembered that these temperatures are recorded in cities, and that the minimum in the surrounding country was 10° to 15° lower.

Other examples are the frosts of August 19 and 20, 1892; those of August 29th and 30th; those of September 5th and 6th; those of September 15, 16, and 17, 1892; and many others.

In conclusion, it is well to impress upon those who would make a success of frost predictions the necessity of a careful study of the State's topography and soil formation. A mental map of its principal rivers, valleys, watersheds, and elevations, with an idea of its general contour, is of great assistance. An exact knowledge also should be acquired of the perishable crops grown, and the sections of the State in which warnings would be of most benefit in saving those crops, that he may at all times place a warning where it will do the most good, and he will be able to announce the advance of many frost waves without being compelled to acknowledge (publicly at least) their killing qualities.

The subject of telegraphing daily warnings was discussed very fully. Messrs. Moore and Strong were in favor of daily warnings, and Mr. Kerkam stated that he had found the plan of telegraphing forecasts only when marked changes

are expected preferable in Louisiana. Mr. Jennings thought the method of sending out forecasts from certain central stations by the Government was bad, inasmuch as certain points were not reached as speedily as they should be, Mr. Kerkam explaining why this was done—to save expense.

The convention then adopted the following resolution, offered by Mr. Burke of Kentucky:

*Resolved*, That the method of sending forecasts daily is the most satisfactory to the public, and that the present method of sending them only when marked changes are expected should be discontinued at the earliest practicable time.

The Treasurer's report was then read and approved, and the Committee on Resolutions being ready made their report, in accordance with resolutions already given in their proper places.

Upon motion of Mr. Conger the by-laws were amended to provide for an executive committee of three, with the president as an *ex officio* member, to which shall be referred all matters for the improvement of the service that may arise between meetings, the members of said committee to be elected by the members of the association annually.

#### Election of officers.

The election of officers for ensuing year was next in order of business. Mr. Jennings suggested the re-election of present officers, to which Mr. Kerkam objected as related to himself. The following gentlemen were then put in nomination: For President, Messrs. Dunwoody, Burke, Pague, and Clarke; For Vice President, Messrs. Clarke, Burke, Pague, Moore, and Salisbury;

For Secretary, Messrs. Berry and Evans;

For Treasurer, Messrs. Salisbury, Strong, and Evans;

Executive Committee, Messrs. Moore, Conger, Jennings, Ball, and Evans;

which resulted in Major Dunwoody being elected President, unanimously, by a rising vote; Messrs. Clarke and Burke First and Second Vice Presidents, respectively, by acclamation; Mr. Berry as Secretary, by acclamation; Mr. Salisbury as Treasurer, unanimously, and the Executive Committee, to be composed of Messrs. Ball, Conger, and Jennings, unanimously.

On motion, duly seconded, meeting was adjourned until next year.

### METEOROLOGICAL TABLES.

Meteorological record of voluntary and other co-operating observers, August, 1893.

Stations.	Temperature. (Fahrenheit.)			Precip'n.		Stations.	Temperature. (Fahrenheit.)			Precip'n.	
	Max.	Min.	Mean.				Max.	Min.	Mean.		
<i>Alabama.</i>	°	°	°	Ins.		<i>Arizona—Cont'd.</i>	°	°	°	Ins.	
Alco.....	95	64	79.6	.....		Benson *.....	101	61	79.0	3.03	
Bermuda *.....	91	64	78.4	.....		Biabec *.....	92*	56	71.8	4.15	
Birmingham *.....	94*	68	83.0*	4.61		Buckeye *.....	108	65	88.2	1.50	
Brewton *.....	100	60	79.8	6.45		Calabasas *.....	93	76	76.0	2.73	
Camden *.....	94	67	80.6	2.51		Casa Grande *.....	106	59	89.3	0.95	
Carrollton *.....	90	62	78.0	3.40		Crittenden *.....	96	58	73.8	5.68	
Citronelle *.....	91	69	80.4	3.90		Dragoon *.....	.....	.....	82.0	4.49	
Chalborne Landing *.....	.....	.....	.....	3.47		Dragon Summit *.....	100	60	82.0	3.19	
Clanton *.....	98	70	86.3	0.20		Dudleyville *.....	103	68	85.2	1.38	
Cordova *.....	.....	.....	.....	1.40		Farley's Camp *.....	96	66	80.0	4.27	
Decatur *.....	.....	.....	.....	1.84		Flagstaff *.....	84	40	64.8	0.66	
Decatur *.....	92	52	75.8	1.82		Florence *.....	100	70	87.8	1.34	
Demopolis *.....	.....	.....	.....	4.46		Fort Apache *.....	93	50	71.0	3.43	
Elba *.....	88	69	77.0	7.66		Fort Bowie *.....	93	61	75.5	3.41	
Eufaula *.....	100	68	80.8	8.85		Fort Grant *.....	100	58	75.0	2.00	
Eufaula *.....	.....	.....	.....	6.80		Fort Huachuca *.....	92	57	72.4	8.99	
Evergreen *.....	94	62	78.5	7.05		Fort Mohave *.....	116	72	93.8	1.79	
Florence *.....	.....	.....	.....	1.72		Gila Bend *.....	106	65	85.5	2.70	
Florence *.....	93	55	77.6	1.21		Holbrook *.....	94	51	73.4	2.70	
Fort Deposit *.....	93	64	79.8	4.68		Maricopa *.....	114	75	92.6	4.84	
Gadsden *.....	.....	.....	.....	3.07		Mount Huachuca *.....	90	60	73.0	4.99	
Geneva *.....	98	68	82.0	6.95		Natural Bridge *.....	.....	.....	75.2	2.47	
Greensboro *.....	92	62	77.8	7.72		Oro *.....	94	55	75.2	0.15	
Healing Springs *.....	95	65	81.2	6.82		Pantano *.....	101	75	85.2	2.75	
Highland Home *.....	92	68	79.0	9.12		Payson *.....	91	56	72.0	1.42	
Livingston *.....	94	59	79.7	8.51		Peoria *.....	106	72	88.8	2.95	
Lynna *.....	99*	55	73.8	2.45		Red Rock *.....	105	79	90.1	3.34	
Maple Grove *.....	99*	55	73.8	2.45		Reymert *.....	100	64	81.6	2.42	
Marion *.....	94	62	80.8	2.71		Rye *.....	.....	.....	73.5	5.82	
Mayesville *.....	94	60	79.0	4.74		St. Helena R'h *.....	92	63	73.5	3.78	
Mount Willing *.....	94	63	79.8	3.23		San Carlos *.....	110	59	83.2	1.88	
Newbern *.....	91	65	79.6	5.21		San Simon *.....	102	72	82.1	1.01	
Newburg *.....	96	50	77.4	3.01		Show Low *.....	.....	.....	89.2	0.00	
Newton *.....	95	66	77.8	8.74		Signal *.....	109	69	89.2	1.01	
Opelika *.....	94	66	79.6	5.69		Teviston *.....	.....	.....	94.7	0.00	
Pine Apple *.....	95	60	79.2	4.23		Texas Hill *.....	113	80	94.7	3.75	
Pushmataha *.....	91	65	79.4	1.82		Tombstone *.....	98	58	76.4	5.05	
Rock Mills *.....	91	62	77.5	8.19		Tucson *.....	106	67	84.4	2.74	
Selma *.....	.....	.....	.....	4.21		Tucson *.....	101	78	87.7	5.45	
Starling *.....	.....	.....	.....	0.90		Walnut Ranch *.....	92	64	72.4	4.30	
Sturdevant *.....	.....	.....	.....	7.33		Whipple Barracks *.....	91	40	69.0	4.29	
Talladega *.....	.....	.....	.....	6.08		Willcox *.....	99	76	87.4	1.03	
Talladega Falls *.....	.....	.....	.....	7.26		Wood Canyon *.....	108	84	93.8	7.00	
Thomasville *.....	94	62	79.6	2.51		Yuma *.....	.....	.....	93.8	0.42	
Tuscaloosa *.....	.....	.....	.....	4.75		<i>Arkansas.</i>	.....	.....	.....	5.68	
Tuscumbia *.....	95	65	77.9	1.72		Arkadelphia *.....	.....	.....	78.6	5.75	
Tuscumbia *.....	94	59	79.5	1.60		Arkansas City *.....	99	54	78.6	3.24	
Union Springs *.....	94	64	79.4	10.51		Ashdown *.....	98	35	77.8	2.45	
Union Springs *.....	94	60	78.9	11.24		Bee Branch *.....	97	55	76.3	3.84	
Uniontown *.....	94	61	80.6	4.07		Brinkley *.....	97	56	76.3	2.77	
Valley Head *.....	91	56	74.7	1.78		Camden *.....	94	56	75.4	1.28	
Warrior *.....	.....	.....	.....	2.07		Camden *.....	93	61	75.6	1.37	
Wilsonville *.....	.....	.....	.....	6.08		Conway *.....	96	49	74.9	0.95	
<i>Alaska.</i>	.....	.....	.....	.....		Dallas *.....	95	60*	74.8	4.63	
Killiknoo *.....	65	45	54.6	9.90		Dardanelle *.....	.....	.....	73.1	2.15	
Metlakatla *.....	74	35	54.4	6.57		Fayetteville *.....	93	48	73.1	5.80	
<i>Arizona.</i>	.....	.....	.....	.....							
Antelope Valley *.....	.....	.....	.....	4.28							
Aris. Canal Co. Dam *.....	109	72	90.9	1.45							

Meteorological record of voluntary observers, &c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.		Stations.	Temperature. (Fahrenheit.)			Precip'n.	
	Max.	Min.	Mean.				Max.	Min.	Mean.		
<i>Arkansas—Cont'd.</i>						<i>California—Cont'd.</i>					
Forrest †	96	57	79.4	3.30		Castroville**	72	52	61.1	0.00	
Fulton †	.....	.....	.....	2.22		Centerville**	96	.....	66.4	0.00	
Gaines Landing †	.....	.....	.....	4.47		Chico**	108	58	78.5	0.00	
Hamburg.....	95	56	77.0	9.40		Chino**	98	50	75.2	0.00	
Helena a †	.....	.....	.....	2.14		Cisco**	82	42	62.1	0.00	
Hot Springs.....	99	52	77.6	3.26		Citrus**	108	.....	78.5	0.00	
Keesee Ferry †	96	48	74.4	3.02		Claremont †	96*	50*	72.0*	0.00	
Kirby †	95	51	76.0	3.05		Cloverdale**	106	52	77.0	0.00	
Lonoke**	97	58	80.0	2.81		Colfax**	99	58	81.6	0.00	
Madding**	.....	.....	.....	78.9	4.62	Colton**	105	58	78.8	0.00	
Malvern †	93	54	75.1	3.43		Colusa †	102	53	75.6	0.00	
Marcella †	97	65	81.2	0.95		Corning.....	112	62	80.0	0.00	
Marshall †	.....	.....	.....	5.70		Crescent City.....	.....	.....	.....	0.00	
Melbourne †	97	50	76.0	0.70		Crescent City L. H.....	.....	.....	.....	0.00	
Mount Nebo †	87	51	73.0	1.88		Crofton**	100	60	81.0	0.00	
New Gascony**	96*	62*	78.9*	3.37		Davisville**	105	60	77.3	0.00	
Newport a †	.....	.....	.....	2.44		Delano	102	53	75.1	0.00	
Newport b †	.....	.....	.....	2.56		Delta**	104	70	80.0	0.00	
Newport c †	97	58	78.4	2.56		Dinuba**	108	60	79.4	0.00	
Oacola a †	95	54	76.0	1.80		Downey**	102	70	85.1	T.	
Ozark †	93	57	77.1	0.65		Dry Creek †	94	62	74.6	0.00	
Pine Bluff †	99	56	79.0	3.85		Duarte.....	100	52	73.0	0.00	
Prescott †	100	60	80.4	3.26		Dunnigan.....	104	64	80.0	0.00	
Rison †	93	60	78.4	1.79		Dunsmuir**	98	50	68.5	0.00	
Rogers †	99	56	79.8	3.09		East Brother L. H.....	.....	.....	.....	0.00	
Russellville †	.....	.....	.....	4.33		Edgewood.....	93	51	67.7	0.00	
Stuttgart †	97	51	77.7	2.02		Edmonton**	93	45	64.4	0.00	
Texas a †	95	55	77.5	2.97		El Casco**	108	60	79.9	0.00	
Texas b †	98	58	80.6	1.88		Eldorado**	105	63	80.0	0.00	
Warm Springs.....	102	60	76.4	0.67		Elmira.....	107	57	79.4	0.00	
Washington b †	97	56	79.0	1.17		El Verano.....	97	55	69.2	0.00	
Wiggs.....	.....	.....	.....	5.50		Emigrant Gap**	85	33	68.0	0.00	
Winslow**	83	58	73.2	7.19		Esparto.....	111	58	80.0	0.00	
<i>California.</i>						<i>Evergreen.....</i>					
Anaheim**	94	58	74.5	0.00		Exeter.....	102	73	83.9	0.00	
Anderson**	106	56	75.8	0.00		Fall Brook**	98	55	70.6	0.00	
Antioch**	104	58	73.9	0.00		Farmington**	106	60	79.0	0.00	
Aptos.....	80	49	60.7	0.00		Felton.....	102	44	69.6	0.00	
Arcata †	70	45	56.6	0.00		Fernando**	100	50	73.0	0.00	
Arlington Heights.....	100	53	76.0	0.00		Florence**	89	62	73.6	0.00	
Athlone**	106	64	83.6	0.00		Florin.....	104	55	72.5	0.00	
Auburn**	102	48	76.6	0.00		Folsom City a**	108	65	81.2	0.00	
Bakersfield a**	108	72	85.1	0.00		Folsom City b**	107	66	78.8	0.00	
Ballast Point L. H.....	.....	.....	.....	0.00		Fort Bidwell.....	97	39	69.4	0.05	
Barstow †	106	54	82.0	0.00		French Corral.....	100	59	77.7	0.00	
Beaumont**	102	67	80.8	0.18		Fresno**	107	65	83.9	0.00	
Belmont**	88	56	68.4	0.00		Fruto**	106	62	81.6	0.00	
Berendo**	112	70	88.7	0.00		Galt.....	106	63	79.1	0.00	
Berkeley.....	76	50	60.6	0.00		Georgetown †	97	56	76.0	T.	
Bishop Creek**	102	70	83.9	T.		Gilroy**	106	57	67.6	0.00	
Boca**	92	35	61.5	0.05		Girard.....	95	65	76.4	0.00	
Borden**	109	63	83.6	0.00		Glen Ellen**	99	52	67.6	0.00	
Boulder Creek**	99	45	59.7	0.00		Goshen.....	110	57	80.3	0.00	
Bradwood**	106	60	73.7	0.00		Grass Valley a.....	.....	.....	.....	0.00	
Brighton**	112	58	81.2	0.00		Haywards**	85	55	63.8	0.00	
Byron**	103	50	74.4	0.00		Healdsburg**	96	46	63.3	0.00	
Calliente**	105	60	83.2	0.00		Hollister**	101	47	61.7	0.00	
Callistoga**	100	54	72.6	0.00		Hornbrook**	102	56	76.1	0.00	
Campo Seco.....	.....	.....	.....	0.00		Humboldt, L. H.....	.....	.....	.....	0.00	
C. Mendocino L. H.....	.....	.....	.....	0.00							
Capitola**	76	52	63.1	0.00							



## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
California—Cont'd.	°	°	°	Ins.	California—Cont'd.	°	°	°	Ins.
Huron * <sup>8</sup>	112	68	86.6	0.00	Redlands b * <sup>8</sup>	103	60	77.5	0.00
Hydesville †	74	41	58.8	0.00	Represa †	98	54	73.4	0.00
Independence †	100	52	77.0	T.	Rio Vista	104	53	74.6	0.00
Indio * <sup>8</sup>	116	78	94.2	0.75	Rocklin * <sup>8</sup>	108	58	79.6	0.77
Ione * <sup>8</sup>	106	60	78.4	0.00	Roe Island L. H.	108	60	84.8	0.00
Iowa Hill * <sup>1</sup>	96	63	77.0	0.00	Rumsey * <sup>8</sup>	108	60	84.8	0.00
Jackson.	97	53	74.9	0.00	Sacramento a †	94	48	66.6	0.00
Julian †	98	49	74.6	0.41	Sacramento b * <sup>8</sup>	98	60	74.7	0.00
Keeler * <sup>8</sup>	95	72	82.8	T.	Sacramento c * <sup>8</sup>	95	60	77.8	0.00
Keene * <sup>8</sup>	97	58	78.5	0.00	Salinas b * <sup>8</sup>	90	52	64.8	0.00
Kennedy Gold					Salton * <sup>8</sup>	116	82	98.9	0.00
Mine * <sup>1</sup>	104	54	73.9	0.00	San Ardo a * <sup>8</sup>	105	47	67.5	0.00
King City * <sup>8</sup>	104	48	65.0	0.00	San Ardo b †	107	41	70.6	0.00
Kingsburg * <sup>8</sup>	110	70	83.6	0.00	San Bernardino †	100	53	75.6	0.00
Knights Landing * <sup>8</sup>	107	54	78.5	0.00	San Gabriel * <sup>8</sup>	99	60	75.9	0.00
Kono Tayee.	94	59	76.8	0.00	Sanger Junction * <sup>8</sup>	110	65	87.3	0.00
Lagrange * <sup>8</sup>	110	55	83.0	T.	San Jacinto †	102	49	76.0	0.00
Lathrop * <sup>8</sup>	102	60	77.1	0.00	San Jose a * <sup>8</sup>	90	52	65.7	0.00
Laurel * <sup>8</sup>	102	47	67.1	0.00	San Jose b.	90	39	63.3	0.00
Lemoore a * <sup>8</sup>	108	62	83.6	0.00	San Luis L. H.				
Lick Observatory †	87	56	71.8	0.00	San Luis Obispo	82	56	65.5	0.00
Lime Point L. H.					San Mateo * <sup>8</sup>	104	53	76.9	0.00
Livermore * <sup>8</sup>	100	54	68.9	0.00	San Miguel * <sup>8</sup>	104	53	76.9	0.00
Livingston * <sup>8</sup>	110	65	82.8	0.00	San Pedro * <sup>8</sup>	90	64	73.8	0.00
Lodi	100	50	72.6	0.00	Santa Ana * <sup>8</sup>	97	60	77.3	0.00
Long Beach * <sup>8</sup>	90	52	67.9	0.00	Santa Barbara a	84	55	66.1	0.00
Los Angeles * <sup>8</sup>	98	60	70.2	0.00	Santa Barbara b * <sup>8</sup>	88	52	68.4	0.00
Los Banos * <sup>8</sup>	106	45	71.5	0.00	Santa Barbara L. H.				
Los Gatos a * <sup>8</sup>	100	54	71.1	0.00	Santa Clara a * <sup>6</sup>	85	48	64.3	0.00
Los Gatos b.	93	44	64.8	0.00	Santa Clara b †	92	44	68.2	0.00
Mammoth Tank * <sup>8</sup>	113	81	96.0	0.00	Santa Cruz a * <sup>8</sup>	83	45	59.5	0.00
Mare Island L. H.					Santa Cruz b †	85	45	63.1	0.00
Mariposa * <sup>1</sup>	103	63	80.2	T.	Santa Cruz L. H.				
Martinez * <sup>8</sup>	92	46	66.2	0.00	Santa Margarita * <sup>8</sup>	103	57	75.7	0.00
Marysville a * <sup>8</sup>	115	64	81.4	0.00	Santa Monica * <sup>8</sup>	82	61	69.8	0.00
Menlo Park * <sup>8</sup>	84	50	66.9	0.00	Santa Paula * <sup>8</sup>	88	58	67.3	0.00
Merced * <sup>8</sup>	109	58	80.9	0.00	Santa Rosa * <sup>8</sup>	101	50	65.5	0.00
Middletown * <sup>1</sup>	104	54	74.8	0.00	Selma * <sup>8</sup>	08	62	85.5	0.00
Milton (near) * <sup>1</sup>	104	60	77.8	0.00	Shasta †	92	42	65.8	0.00
Modesto * <sup>8</sup>	105	67	83.2	0.00	Shingle Springs * <sup>8</sup>	195	56	73.7	0.00
Mohave * <sup>8</sup>	104	69	85.4	0.00	Sims * <sup>8</sup>	01	49	71.3	0.00
Mokelumne Hill * <sup>8</sup>	106	61	78.2	0.00	Sisson * <sup>8</sup>	95	47	65.6	0.00
Monson * <sup>8</sup>	106	65	85.0	0.00	Soledad * <sup>8</sup>	92	50	62.3	0.00
Montague * <sup>8</sup>	98	68	79.9	0.00	Sonoma * <sup>8</sup>	91	48	60.7	0.00
Monterey * <sup>8</sup>	72	50	61.1	0.00	S. E. Farrallon L. H.	86	48	60.8	0.00
Monterey (Hotel					South Vallejo * <sup>8</sup>	86	48	60.8	0.00
del Monte) * <sup>8</sup>	72	51	60.7	0.00	Spadra * <sup>8</sup>	98	56	75.0	0.00
Mount Glenwood * <sup>1</sup>	106	62	81.5	0.00	Stockton a	100	53	73.4	0.00
Napa City a * <sup>8</sup>	98	47	64.0	0.00	Stockton b * <sup>8</sup>	100	62	80.0	0.00
Napa City b.	87	49	64.7	0.00	Suisun City * <sup>8</sup>	97	57	70.1	0.00
National City †	95	58	71.0	0.00	Summit * <sup>8</sup>	79	47	67.2	0.00
Needles a †	111	74	93.5	0.52	Susanville * <sup>1</sup>	89	58	71.6	0.00
Nevada City †	94	46	67.6	0.00	Thachapi a * <sup>8</sup>	93	60	72.0	0.00
New Almaden * <sup>8</sup>	94	55	68.1	0.00	Tehachapi b.	97	46	72.4	0.00
Newark * <sup>8</sup>	86	56	67.1	0.00	Tehama * <sup>8</sup>	106	60	83.6	0.00
Newcastle a †	104	52	78.4	0.00	Templeton * <sup>8</sup>	108	53	71.9	0.00
Newcastle b * <sup>8</sup>	108	70	84.5	0.00	Towles * <sup>8</sup>	93	54	69.8	0.00
Newhall * <sup>8</sup>	108	58	77.5	0.00	Tracy * <sup>8</sup>	103	60	78.4	0.00
Newman * <sup>8</sup>	108	70	84.3	0.00	Traver * <sup>8</sup>	106	70	87.7	0.00
Niles * <sup>8</sup>	92	50	63.3	0.00	Trinidad L. H.				
Nordhoff †	100	46	70.6	0.00	Tropico * <sup>8</sup>	90	58	71.0	0.00
Norwalk * <sup>8</sup>	95	58	70.8	0.00	Truckee * <sup>8</sup>	88	44	66.2	0.00
Oakdale * <sup>4</sup>	108	56	77.5	0.00	Tulare a * <sup>8</sup>	107	67	85.3	0.00
Oakland a.	82	49	61.3	0.00	Tulare b.				
Oakland b * <sup>8</sup>	74	52	61.3	0.00	Tulare c.	112	52	82.8	0.00
Ogilby * <sup>8</sup>	115	78	97.1	0.03	Turlock a * <sup>8</sup>	108	65	84.4	0.00
Ontario	98	64	77.5	0.00	Turlock b * <sup>1</sup>	105	53	72.7	0.00
Orangevale †	107	53	77.4	0.00	Ukiah †	99	46	70.2	0.00
Orland * <sup>8</sup>	115	70	89.2	0.00	Upper Lake	105	47	75.0	0.00
Oroville a * <sup>8</sup>	104	64	80.9	0.00	Upper Mattole * <sup>1</sup>	93	50	67.4	0.00
Pajaro * <sup>8</sup>	89	38	58.0	0.00	Vacaville a * <sup>1</sup>	108	58	76.5	0.00
Palermo †	104	51	77.7	0.00	Vacaville b * <sup>8</sup>	108	58	77.6	0.00
Palm Springs * <sup>8</sup>	116	80	97.0	0.40	Valley Springs * <sup>8</sup>	103	65	81.5	0.00
Pasadena.	95	50	70.6	T.	Ventura †	85	52	66.2	0.00
Paso Robles * <sup>8</sup>	107	54	72.8	0.00	Vina * <sup>8</sup>	107	62	80.4	0.00
Petaluma * <sup>1</sup>	91	54	64.0	0.00	Volcano Springs * <sup>8</sup>	122	85	103.0	0.45
Piedras Blancas L. H.					Walnut Creek	104	54	72.8	0.00
Pigeon Point L. H.					Westley * <sup>8</sup>	106	63	80.7	0.00
Placerville a * <sup>8</sup>	102	54	71.8	0.00	Wheatland	107	55	77.7	0.00
Placerville b †	98	45	72.5	0.00	Whittier * <sup>8</sup>	98	60	75.6	0.00
Pleasanton a * <sup>8</sup>	105	55	67.6	0.00	Williams a * <sup>8</sup>	108	60	80.1	0.00
Pleasanton b.	99	40	68.0	0.00	Willows a †	106	50	77.4	0.00
Pt. Ano Nuevo L. H.					Willows b * <sup>8</sup>	105	63	83.5	0.00
Point Arena L. H.					Winchester †	109			
Point Bonita L. H.					Winters * <sup>8</sup>	109	67	83.7	0.00
Pt. Conception L. H.					Woodland * <sup>8</sup>	108	50	75.8	0.00
Point Fermin L. H.					Yerba Buena L. H.				
Point George L. H.					Yreka †	97	44	70.4	0.00
Pt. Huenehme L. H.					Yuba City * <sup>8</sup>	104	66	81.4	0.00
Point Lobos	66	48	54.9	0.14	Colorado.				
Point Loma L. H.					Abbott				
Point Montara L. H.					Akron †	95	41	70.0	0.73
Point Pinos L. H.					Alma †	70	29	49.2	1.71
Point Reyes L. H.					Breckenridge †	80	28	50.8	3.79
Point Sur L. H.					Byers * <sup>1</sup>	92	58	75.2	2.00
Pomona * <sup>8</sup>	99	52	73.0	0.00	Canyon †	94	46	70.6	1.42
Porterville a * <sup>8</sup>	107	72	88.0	0.00	Castle Rock †	90	43	66.8	1.42
Port Los Angeles a * <sup>8</sup>	88	59	67.6	0.00	Cheyenne Wells * <sup>1</sup>	102	56	72.3	1.64
Port Los Angeles b * <sup>1</sup>	86	65	73.0	0.00	Collbran				
Poway * <sup>8</sup>	99	62	68.6	0.00	Como (near) †	72	36	52.2	3.14
Puente * <sup>8</sup>	99	60	73.8	0.00	Cope †	94	35	70.6	0.86
Ravenna * <sup>8</sup>	106	64	80.1	0.00	Deer Trail * <sup>8</sup>	88	52	73.2	3.08
Red Bluff * <sup>8</sup>	108	70	87.7	0.00	Delta †	101	45	71.0	3.78
Redding a * <sup>8</sup>	110	60	82.3	0.00	Downing †	92	50	71.0	3.78
Redding b †	104	56	80.4	0.00	Dumont	84	38	61.1	2.35

## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
Colorado—Cont'd.					Florida—Cont'd.				
East Dale.	°	°	°	Ins.	Hypoluxo *†‡	94	°	°	Ins.
First View * <sup>6</sup>	92		70.6	1.40	Kissimmee †	96	75	81.8	2.31
Fort Collins (near).				0.25	Lake City †	93	71	83.7	5.87
Fruita †	101	49	73.5	2.21	Lake City †	93	72	81.9	5.31
Glen Eyrie †	80	44	63.1	3.92	Manatee †	94	65	80.6	4.91
Gold Hill * <sup>6</sup>	86	46	65.5	1.65	Merritts Island †	92	74	82.4	4.46
Grand Junction †	97	57	74.3	1.20	Moseley Hall †	94	68	81.6	6.02
Greeley †	90			1.04	Mullet Key †	102	72	82.9	6.41
Greenhorn †	89	46	62.0	1.60	Myers †	92	71	79.6	6.63
Gunnison †	89	32	60.2	1.89	New Smyrna †	90	66	79.4	6.60
Hugo * <sup>1</sup>	92	49	68.5	1.23	Ocala * <sup>1</sup>	94	72	80.2	4.03
Hugo (near) †	91			1.23	Orlando †	94	63	77.8	6.34
Husted †	91	39	65.2	2.29	Oxford * <sup>1</sup>	93	72	79.5	6.34
Julesburg †	95	40	69.1	1.46	Plant City †	96	69	82.0	11.10
Kirk				0.10	Saint Francis B'ks.	94	70	80.7	7.67
La Jara †	86	42	63.4	2.08	Saint Petersburg †	94	70	82.0	8.91
Lamar †	98	50	74.9	1.62	Tallahassee †	92	69	78.9	8.95
La Porte				0.64	Tarpon Springs †	92	71	82.0	5.24
Las Animas †	93	47	71.4	2.11	Georgia.				
Lavender †	93	35	61.1	2.13	Adairsville †	98	58	78.8	2.04
Le Roy *† <sup>1</sup>	96	46	69.4	0.61	Alapaha †	95	64	80.8	6.80
Leslie				0.93	Albany †	97	66	81.6	1.99
Livermore	90	44	64.2	1.11	Americus †	96	65	81.2	7.09
Loveland				0.49	Athens †	90	64	76.8	4.25
McCoy †				5.53	Athens †	95	61	78.0	6.49
Middle Box Elder.				0.67	Bainbridge †	98	67	82.0	3.87
Minneapolis †	98	39	68.6	2.85	Brunswick †				3.30
Monte Vista †	83	40	61.8	2.79	Blakely *† <sup>8</sup>	94	68	80.4	5.33
Moraine †	79	34	57.2	1.83	Brag †	93	63	79.0	13.41
Pagoda (near) †	93	36	63.8	2.62	Camak †	94	60	76.2	5.01
Paonia †				2.31	Camilla	93	69	82.5	6.10
Parachute †				1.32	Canton †				2.27
Red Cliff	93	36	68.8	1.67	Colutha	95	55	77.2	2.34
Rico.				1.33	Columbus †	92	70†	80.6†	5.79
River Bend *	90	58		1.50	Cordele †	100	63	81.6	6.10
Rocky Ford †	92	47	71.9	3.20	Covington.	93	62	77.2	6.52
Sanborn				1.75	Darien †	95	68	80.6	17.31
San Luis †	85	33	59.4	2.33	Diamond †	91	54	73.8	2.76
Scissors †				2.70	Dublin †	93	64	80.8	10.61
Seibert †				2.10	Eastman †	94	62	79.4	7.35
Smoky Hill Mine †	86	40	63.0	1.19	Elberton †	91	61	77.1	5.28
Snyder	99	40	71.5	1.68	Fleming †	93	52	76.5	8.97
Springfield †				3.49	Forsyth *†	96	68	79.5	13.45
Stamford * <sup>1</sup>	84	32	50.9	5.50	Fort Gaines †	95	64	79.7	6.44
Sunnyside	81	34	56.1	2.89	Gainesville †	98	62	77.7	4.18
Surface Creek †	82	47	67.8	2.64	Gillsville *† <sup>1</sup>	92	66	76.3	7.65
Table Rock	80	41	60.4	1.68	Griffin †	95	64	77.8	6.28
Thon †	95	42	67.2	0.93	Hawkinsville †	91			6.91
Tilas				1.61	Hephzibah *† <sup>3</sup>	90	70	78.6	8.48
Waller †				0.95	Hemerville †	95	56	79.4	8.37
Ward District				0.11	Lafayette †	92	58	75.9	3.38
Watkins * <sup>1</sup>	90	60	74.9	1.83	Lagrange †	92	63	77.8	9.53
Wildest †				1.83	Louisville †	94	63	79.0	8.16
Yuma				0.95	Lumpkin †	91	69	79.0	10.28
Zuck				1.84	McArthur †	98	67	81.3	10.30
Connecticut.					Macon †	93	69	82.2	4.75
Bridgeport * <sup>1</sup>	87	58	70.7	.....	Macon †				8.12
Canton	91	46	70.2	4.91	Marietta †	90	60	74.8	1.05
Colchester	90	47	69.7	4.23	Marshallville †				4.90
Falls Village.				5.50	Milledgeville †	92	65	76.2	10.40
Greenfield Hill				8.23	Millen †	97	62	79.6	6.37
Hartford b.				4.14	Monticello *† <sup>1</sup>	89†	70*	80.1*	6.98
Hartford c.	89	50	70.8	.....	Morgan †	96	63	78.1	7.58
Lake Konomoc				3.37	Newman †	91	61	76.7	8.45
Lebanon				3.64	Point Peter *†	90	66	77.7	5.05
Middletown	91	44	70.4	4.98	Quitman b. †	96	68	80.6	6.16
New Hartford a *† <sup>1</sup>	94	53	70.4	5.71	Resaca †				4.49
New Hartford b.				5.47	Reynolds †				6.51
North Franklin				3.43	Rome †	96	58	76.1	3.43
N. Grosvenor Dale †	89	47	68.7	4.03	Talbotton †	90	64	76.9	9.39
North Woodstock				3.50	Thomasville †	97	66	81.2	5.49
Norwalk b.	88	46	69.4	6.57	Toccoa †	84	60	71.8	4.35
South Manchester.				4.58	Union Point †	92	64	77.1	3.32
Stevenson				7.81	Washington †	92	57	76.2	6.49
Storrs †	90	46	68.0	3.79	Way Cross †	91	68	80.6	5.09
Thompson †	88	48	67.7	.....	Waynesboro †	94	64	78.2	9.79
Voluntown †	89	43	68.4	4.14	West Point †	91	70	81.4	10.71
Wallingford †				4.75	Whitesburg †				8.57
Waterbury	89	48	69.9	7.22	Idaho.				
West Simsbury				4.29	American Falls †	106	32	67.3	0.25
Delaware.					Boise Barracks	106	42	71.4	0.00
Dover †	90	57	73.0	3.93	Bonanza City †	90	27	57.8	0.16
Kirkwood †				79.2	Cottonwood †	99	35	64.4	0.03
Millford †	90	57	73.4	3.41	Fort Sherman	96	38	68.8	0.60
Millboro †	94	54	72.9	4.00	Golden Valley †	98	38	67.4	†
Seaford †	95	56	73.1	2.64	Kootenai †	95	40	63.6	0.22
District of Columbia.					Lake †	92	30	58.8	0.56
Dist'ing Reserv' r * <sup>3</sup>	90	58	75.6	1.85	Martin †	93	33	62.6	0.12
Rec'ing Reserv' r * <sup>3</sup>	90	58	74.8	2.86	Oakley †	100	37	71.4	†
West Washington †	95	54	76.9	2.22	Paris †	94	34	64.9	0.48
Florida.					Payette †	108	36	70.2	0.00
Amelia †	91	68	80.2	10.50	Illinois.				
Archer †	96	68	80.8	6.38	Alton †				1.50
Bristol †	98	70	83.9	4.79	Atwood * <sup>2</sup>	98	46	70.2	†
Brookville †	91	70	80.4	7.30	Aurora †	98	39	69.8	0.32
Chattahoochee					Beardstown †				0.41
Landing †				3.75	Bushnell †	96	44	72.4	4.89
Clermont †	96	72	80.9	5.23	Carlinville †	98	49	75.1	0.51
Eustis †	97	69	80.8	3.22	Carlyle				0.89
Federal Point †	93	68	80.0	9.89	Chester †				0.41
Fort Meade †	92	70	81.0	6.93	Dixon †	98	38	68.7	0.39
Gainesville †	96	67	82.4	8.48	Dubois *† <sup>1</sup>	98	59	73.9	0.45
Gasmere †	93	71	81.0	.....	East Peoria †	98	41	69.2	0.53
Green Cove Spgs †	95	70	81.4	8.48	Effingham †	98	41	71.6	1.70
Homeland †	96	69	80.1	10.42	Fort Sheridan †	94	48	67.9	0.10
					Galva †	99	43	71.2	0.00

Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Illinois—Cont'd.</i>				<i>Ins.</i>	<i>Iowa—Cont'd.</i>				<i>Ins.</i>
Golconda†.....	92	61	77.6	2.50	Charles City†.....	96	36	68.6	1.20
Greenville†.....	92	52	73.2	0.19	Clarinda†.....	92	44	69.7	6.22
Griggsville†.....	94	48	72.4	0.35	Clinton†.....	96	40	69.6	1.20
Havana†.....	94	53	72.9	0.73	College Springs.....	96	42	68.0	3.54
Hennepin†.....	99	39	71.5	0.38	Corning†.....	96	40	67.8	6.16
Herrins Prairie*1.	99	39	77.8	1.95	Cresco†.....	94	38	67.4	1.20
Jordans Grove†.....	92	51	73.4	2.39	Decorah†.....	93	38	68.0	0.90
Kankakee†.....	96	44	68.8	0.55	Delaware*2.	96	46	66.9	1.06
Lagranger†.....	99	45	68.8	0.23	Denison†.....	96	40	67.9	3.79
Louisville*2.	99	54	73.5	1.20	Des Moines (near)†	94	40	70.6	1.49
McLeansboro*1.	100	55	73.9	2.12	Eagle Grove*2.	98	38	66.0	3.00
Martinsville†.....	96	44	72.4	0.54	Elkader†.....	98	37	67.6	0.83
Mascoutah*2.	95	56	73.4	1.30	Emmettsburg†.....	97	39	68.6	2.36
Mattoon†.....	98	53	73.8	1.21	Estherville†.....	95	35	65.8†	1.79
Mount Carmel†.....	99	49	72.2	1.44	Fayette†.....	99	35	69.2	2.04
Mount Pulaski†.....	94	49	72.2	0.35	Fort Madison*†1.	95	52	74.3	1.88
Olney*1.	95	52	75.6	2.65	Fulton*1b.	96	44	68.9	1.75
Olney*2.	100	51	71.4	3.14	Galva†.....	95	37	68.3	2.96
Oregon†.....	98	50	75.6	0.81	Glenwood†.....	98	42	73.6	3.85
Oswego*1.	96	46	68.1	0.22	Grand Meadow*1.	90	43	66.8	1.70
Ottawa†.....	100	42	71.2	0.77	Greenfield†.....	96	40	69.2	2.92
Palestine†.....	95	47	70.5	2.71	Grundy Center†.....	96	38	67.9	1.56
Pana†.....	97	60	76.2	0.30	Hampton†.....	96	37	66.1	1.15
Paris†.....	96	40	72.9	0.38	Hawkeye†.....	96	45	70.0	1.09
Peoria†.....	99	50	74.1	0.45	Hopeville†.....	92	45	70.0	3.40
Peoria†.....	99	50	74.1	0.45	Hopkinton*2.	92	45	71.0	1.25
Philo†.....	98	38	73.6	0.46	Humboldt†.....	96	38	67.9	2.13
Quincy†.....	98	48	74.0	0.20	Independence†.....	96	38	67.9	0.75
Rantoul*2.	98	48	74.0	0.20	Iowa City†.....	94	45	70.4	1.64
Riley†.....	94	48	69.3	0.45	Iowa Falls†.....	97	37	67.8	0.95
Rockford†.....	90	50	69.0	1.13	Jefferson†.....	96	37	69.2	1.76
Rushville†.....	100	48	74.4	1.91	Keosauqua†.....	97	43	72.2	2.26
Saint John*2.	95	60	77.0	1.58	Knoxville†.....	97	42	70.2	3.41
Shawneetown†.....	96	40	72.9	0.38	Larrabee†.....	96	35	68.4	3.18
Sycamore*1.	93	44	68.0	0.46	Le Claire†.....	94	37	70.0	1.99
Tuscola†.....	94	58	77.7	0.50	Logan†.....	94	37	70.0	1.99
Walnut†.....	99	41	73.4	0.48	Maquoketa*1.	96	52	69.3	1.62
Warsaw†.....	99	41	73.4	0.48	Marshall†.....	92	43	69.7	2.43
White Hall*†1.	94	52	70.6	0.36	Mason City†.....	93	34	67.0	1.83
Winnebago†.....	95	40	68.5†	0.80	Maxon†.....	98	50	71.4	3.42
<i>Indiana.</i>					Mechanicsville†.....	92	42	67.8	2.30
Angola*1.	95	48	71.1	0.86	Monticello*†1.	95	39	68.2	1.23
Ashboro†.....	95	43	72.0†	1.78	Mount Ayr†.....	94	43	72.0	3.98
Bedford†.....	97	51	74.8	1.00	Mount Pleasant*2.	88	40	69.4	1.46
Butler†.....	97	46	73.4†	0.70	Murray†.....	95	43	70.0	5.73
Cambridge City†.....	94	46	68.9	0.89	Newton†.....	95	43	70.0	3.35
Columbia City*1.	92	50	69.6	0.72	Osage*†2.	96	40	64.4	2.57
Columbus*2.	92	60	73.0	1.12	Oskaloosa†.....	99	39	69.2	1.09
Connersville†.....	92	47	70.4	0.57	Ovid†.....	96	42	70.9	3.53
Crawfordsville*†1.	91	40	68.0	0.80	Panama†.....	94	40	68.4	2.32
Decatur†.....	92	53	73.8	1.26	Richland*1.	100	43	70.1	1.91
Evansville†.....	91	45	69.8	0.65	Rock Rapids†.....	94	34	68.2	1.24
Farmland†.....	91	45	69.8	0.65	Sac City†.....	95	39	67.7	2.05
Franklin*1.	93	40	72.9†	0.16	Seymour†.....	98	42	70.2	4.07
Hawpating†.....	94	43	68.9	0.77	Sibley†.....	92	35	66.4	2.26
Huntingburg*1.	90	58	73.5	0.77	Storm Lake†.....	94	44	71.0	1.90
Jasper†.....	94	50	75.4	1.53	Villisca†.....	91	39	70.0	6.32
Jeffersonville†.....	92	54	75.2	1.91	Vinton*1.	94	41	69.1	1.40
Kokomo†.....	96	40	69.0	0.36	Washington†.....	98	47	74.4	1.65
Lafayette†.....	97	39	72.3	0.77	Webster City*1.	99	40	68.7	2.90
Logansport†.....	91	43	70.4	0.54	West Bend*†1.	92	43	67.0	1.28
Madison*1.	94	59	76.8	1.01	Williams*1.	96	50	68.4†	1.79
Madison*2.	94	59	76.8	1.01	Winterset†.....	100	43	70.8	2.91
Marion†.....	97	40	73.2	0.99	<i>Kansas.</i>				
Markle†.....	93	44	70.2	0.90	Abilene†.....	97	47	73.8	6.61
Mauzy†.....	93	44	70.2	0.90	Achilles*†2.	95	39	69.0	1.29
Mount Vernon†.....	91	59	76.1	2.29	Allison*†2.	93	41	73.2	1.74
Muncie*†1b.	91	59	76.1	2.29	Altova*†2.	100	49	74.2	1.37
New Albany*†1.	93	58	76.3	0.72	Athol†.....	95	44	73.2	4.73
Princeton*†1.	96	50	74.5	0.53	Beloit†.....	97	45	72.2	2.66
Rockville†.....	93	40	71.7	0.83	Bucklin†.....	98	48	74.6	3.00
Rushville†.....	96	48	73.3	0.40	Colby†.....	95	41	70.8	1.35
Seymour†.....	96	48	73.3	0.40	Coldwater†.....	100	49	75.3	1.24
Terre Haute†.....	98	47	73.8	0.59	Collyer*1.	100	62	82.2	1.12
Valparaiso†.....	95	43	69.8	0.20	Columbus†.....	98	47	75.0	2.42
Vevay†.....	94	50	72.4	1.27	Cunningham†.....	103	41	75.4	1.37
Vincennes†.....	92	45	72.1	3.56	Downs†.....	101	42	78.0	0.73
Worthington†.....	92	45	72.1	3.56	Eldorado†.....	102	52	76.2	1.91
<i>Indian Territory.</i>					Elk City*1.	102	52	76.2	1.91
Colbert†.....	95	45	74.4	4.37	Ellis*2.	103	46	76.6	1.03
Eufaula†.....	95	45	74.4	4.37	Emporia†.....	97	54	75.1	2.07
Fort Supply†.....	99	69	83.8	2.21	Englewood†.....	102	44	73.6	1.98
Gwendale†.....	97	50	77.7	5.62	Eureka Ranch†.....	102	41	73.2	2.00
Purcell†.....	106	57	80.9	7.64	Fort Riley†.....	96	48	74.2	6.40
South McAlester†.....	95	53	77.8	7.35	Gibson*1.	97	43	69.2	3.46
Tulsa†.....	95	53	77.8	7.35	Gove City*†1.	98	54	72.5	1.51
<i>Iowa.</i>					Grenola*1.	111	50	77.2	0.23
Algona*1.	96	46	68.4	0.40	Grinnell*2.	100	60	77.0	0.90
Alta†.....	95	40	66.4	1.73	Halstead†.....	98	40	71.4	1.65
Amana†.....	96	39	69.4	3.02	Havensville*†1.	97	45	71.5	2.07
Ames*2.	97	36	68.0	1.62	Horton†.....	93	45	71.8	4.68
Ames*3.	97	36	68.0	1.62	Hutchinson†.....	99	43	75.1	1.74
Ames (near)*1.	98	40	72.5	1.08	Independence†.....	104	49	75.3	2.53
Audubon†.....	97	36	71.4	1.98	Kansas City†.....	95	42	71.6	1.84
Belle Plaine†.....	97	40	69.2	1.99	Kellogg†.....	103	44	76.7	1.13
Blakeville†.....	96	49	72.1	1.12	Kiowa†.....	101	49	77.0	4.28
Bonaparte†.....	101	40	70.0	2.02	La Crosse†.....	99	45	75.8	6.34
Carroll†.....	94	38	68.5	2.97	Lakin†.....	110	38	71.2	1.09
Cedar Falls†.....	96	35	70.0	1.09	Lawrence†.....	93	48	72.0	2.86
Cedar Rapids†.....	92	45	70.2	2.47	Leoti†.....	98	44	73.8	1.56
Centerville†.....	97	44	73.0	3.20	Liberal†.....	97	46	72.6	1.05

Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Kansas—Cont'd.</i>					<i>Louisiana—Cont'd.</i>				
McPherson†.....	99	45	74.8	4.24	Opelousas†.....	91	62	79.2	5.29
Manhattan†.....	.....	.....	.....	2.96	Oxford.....	97	54	79.2	4.80
Manhattan†.....	101	41	72.3	2.92	Paincourtville†.....	96	59	80.4	4.17
Manhattan*1.....	102	41	70.8	2.81	Plain Dealing.....	94	60	80.8	2.63
Mankato†.....	94	43	74.0	.....	Plaquemine.....	95	69	80.8	5.96
Marion†.....	97	43	73.7	2.77	Rayne†.....	96	61	79.7	3.08
Marmaton.....	.....	.....	.....	2.31	Roseland.....	95	60	80.4	7.11
Medicine Lodge†.....	.....	.....	.....	2.25	Schriever†.....	100	62	81.0	9.27
Minneapolis†.....	102	41	73.2	3.45	Shell Beach.....	94	66	80.6	7.19
Morland†.....	95	40	71.3	3.30	Sugar Ex. Station†1.	92	65	80.6	2.99
Morton†.....	102	50	75.2	4.33	Sugartown†.....	94	55	75.4	5.56
Mount Hope*1.....	99	52	70.7	1.14	Thibodaux.....	.....	.....	.....	5.02
Ness City†.....	100	54	76.5	2.34	Wallace.....	93	65	80.2	6.95
Norton†.....	95	41	72.8	2.75	West End.....	.....	.....	.....	4.90
Oberlin†.....	.....	.....	.....	2.40	Winnfield†.....	95	58	79.3	3.85
Olathe†.....	95	43	72.5	1.39	Winnboro.....	97	48	76.2	2.71
Oswego†.....	104	43	76.5	1.80	<i>Maine.</i>				
Pauline.....	98	49	75.2	3.25	Bar Harbor.....	89	48	65.5	4.14
Phillipsburg†.....	98	46	72.6	3.20	Belfast*2.....	87	54	67.3	3.82
Pleasant Dale*1.....	100	43	72.0	4.43	Calais†.....	90	45	66.8	3.84
Quinter*2.....	99	50	76.8	2.50	Cornish*1.....	94	53	67.1	3.94
Rome*1.....	100	47	76.4	1.66	Easton†.....	96	41	66.2	4.16
Sedan†.....	101	50	76.9	1.78	Farmington†.....	102	40	68.0	3.76
Sharon Springs*1.....	100	58	72.2	4.00	Fort Kent†.....	85	41	63.2	5.27
Sterling†.....	100	45	76.0	2.30	Gardiner†.....	98	48	68.0	3.27
Syracuse†.....	90	49	71.2	3.72	Houlton†.....	97	42	66.6	2.98
Tribune†.....	97	47	74.7†	1.65	Lewiston†.....	98	50	68.4	3.55
Ulysses†.....	104	46	76.0†	1.64	Mattawamkeag*2.....	98	45	68.0	4.12
Wa Keeney*1.....	96	60	73.8	1.53	Mayfield.....	93	42	65.6	5.20
Wakefield*1.....	104	55	75.7	3.69	Orono†.....	95	47	65.8	3.90
Wallace†.....	.....	.....	.....	1.61	Petit Menan*1.....	75	50	63.7	.....
Wallace*1.....	96	64	76.0	1.90	West Jonesport*1.....	80	50	59.9	.....
Wamego*1.....	96	63	73.9	4.05	<i>Maryland.</i>				
Washington†.....	99	44	72.7	5.25	Barren Crk Spgs†1.....	93	56	73.8	2.67
Winona*2.....	94	36	72.5	1.30	Benedict†.....	93	57	75.9	3.16
Yates Center†.....	97	.....	.....	1.65	Boethcheville*1.....	97	44	71.7	4.20
<i>Kentucky.</i>					Kentucky.....	95	63	78.8	1.68
Bowling Green*†1.....	93	54	72.0	1.37	Cumberland a†.....	94	50	72.2	3.74
Burnside†.....	.....	.....	.....	1.23	Cumberland b.....	96	52	74.0	4.03
Caddo*†1.....	93	63	74.0	0.70	Darlington†.....	90	54	72.5	3.60
Canton*†1.....	96	58	76.1	.....	Easton†.....	92	57	74.8	4.24
Carrollton*†1.....	97	58	76.3	1.03	Fallston*1.....	97	54	71.8	6.26
Cattlettsburg*†2.....	90	60	75.4	3.56	Fenby*1.....	94	54	72.8	4.20
Earlington.....	96	57	76.6	0.89	Frederick†.....	94	52	75.4	1.93
Eddyville.....	.....	.....	.....	1.36	Glyndon†.....	94	49	70.5	2.68
Edmonton†.....	88	54	73.2	2.09	Great Falls*2.....	93	56	74.6	2.81
Eubank†.....	92	51	71.1	2.79	McDonough.....	91	55	73.6	2.82
Falmouth†.....	.....	.....	.....	1.17	New Market*1.....	95	54	72.4	2.06
Flemingsburg*†1.....	93	58	.....	0.63	Oakland†.....	84	41	63.6	3.71
Franklin*1.....	94	66	77.2	0.39	Solomons†.....	93	62	77.4	3.07
Greendale*1.....	91	58	73.7	2.09	Sunnyside†.....	90	41	64.4	3.68
Greensburg*†1.....	88	56	72.4	3.26	Upper Marlboro†.....	91	53	73.9	3.80
Harrodsburg†1.....	99	48	73.9	3.05	Woodstock.....	94	51	72.2	2.88
Hendricks†.....	.....	.....	.....	1.80	<i>Massachusetts.</i>				
Lancaster.....	.....	.....	.....	0.90	Adams a.....	91	42	67.6	.....
Louis a.....	95	51	73.2	3.51	Amherst.....	91	42	68.5	2.49
Matlock*1.....	92	58	76.7	1.82	Amherst Ex. St'n a†.....	94	40	68.0	3.42
Middleboro†.....	91	51	71.2	1.40	Amherst Ex. St'n b.....	96	39	69.2	3.40
Mount Sterling†.....	91	51	71.3	0.93	Ashland.....	.....	.....	.....	5.45
Murfreesville*†1.....	89	56	75.7	3.16	Bedford.....	89	46	68.1	6.00
Paducah a.....	.....	.....	.....	2.80	Beverly Farms.....	86	47	65.9	5.66
Paducah b†1.....	98	59	80.4	2.52	Blue Hill (sum' t').....	89	48	67.9	6.88
Pellville†.....	93	53	74.4	2.72	Blue Hill (valley).....	92	43	68.7	6.75
Princeton†.....	99	53	76.8	0.93	Boston.....	.....	.....	.....	7.01
Russellville†1.....	94	53	75.5	0.62	Cambridge a.....	94	48	70.0	5.20
Shelby City*1.....	89	56	73.1	1.67	Cambridge b.....	88	51	69.6	5.95
Shelbyville†.....	97	50	74.3	1.48	Chestnut Hill.....	94	50	70.4	6.23
South Fork†2.....	.....	.....	.....	2.00	Clinton.....	.....	.....	.....	3.70
Springfield†.....	93	53	74.5	1.90	Concord.....	92	43	68.4	6.15
Wickliffe*†1.....	95	60	75.7	1.13	Dudley†.....	94	46	69.6	1.55
Williamsburg a†.....	.....	.....	.....	0.86	East Templeton*1.....	93	53	67.4	3.76
<i>Louisiana.</i>					Egg Rock, Nahant.....	85	53	66.1	.....
Abbeville†.....	96	64	75.8	3.08	Fall River a*1.....	86	52	69.0	6.77
Alexandria†.....	95	55	76.8	6.84	Fiskdale.....	.....	.....	.....	3.85
Amite†.....	98	58	80.4	7.76	Fitchburg a*1.....	90	55	67.5	7.58
Baton Rouge†1.....	91	64	78.8	4.84	Fitchburg b.....	94	46	68.6	8.95
Cameron†.....	96	58	78.2	4.60	Framingham.....	93	46	68.3	5.38
Cheneyville†.....	94	58	79.2	5.59	Gilbertville.....	92	39	67.8	3.40
Clinton†.....	98	72	85.7	7.42	Great Barrington†.....	91	42	67.5	5.44
Coushatta a†.....	.....	.....	.....	2.54	Groton a.....	90	47	67.5	5.26
Coushatta b†.....	99	56	81.0	2.97	Hingham.....	.....	.....	.....	5.33
Covington†.....	96	59	76.4	3.08	Hyannis†.....	91	55	72.3	5.39
Davis.....	96	55	78.0	3.96	Kendall Green.....	.....	.....	.....	5.80
Deth†.....	.....	.....	.....	3.99	Lake Cochituate.....	95	39	69.3	5.86
Donaldsonville†.....	94	68	81.5	2.38	Lawrence.....	90	48	69.4	4.68
Emile†.....	93	62	80.1	4.07	Leeds.....	94	40	68.0	5.51
Farmerville†.....	99	59	79.6	2.29	Leominster*2.....	90	52	67.2	5.18
Franklin†.....	92	65	80.7	7.49	Long Plain*4.....	88	56	67.6	4.69
Girard†.....	96	64	80.9	5.87	Lowell a.....	93	50	66.9	3.94
Grand Coteau b.....	93	65	78.7	5.39	Lowell b.....	93	45	68.6	.....
Lumburg†.....	91	61	78.6	7.73	Lowell c.....	97	49	71.0	.....
Lummond†.....	95	59	80.3	5.26	Ludlow Center.....	93	37	66.8	3.10
Manerette†.....	97	63	81.2	6.84	Lynn a.....	86	50	67.0	8.68
Mayette†.....	96	61	81.7	4.41	Lynn b.....	95	51	70.6	.....
Lake Charles†.....	95	58	79.0	11.25	Mansfield*1.....	93	48	68.1	5.74
Lake Providence†.....	95	58	79.3	.....	Medford.....	.....	.....	.....	5.32
Lawrence†.....	93	72	82.0	7.35	Middleboro.....	89	44	68.0	5.21
Liberty Hill.....	101	58	81.4	2.99	Milton*1.....	88	45	66.1	6.69
Lufkin†.....	99	60	81.6	3.38	Monroe.....	89	39	64.4	9.03
Lafayette.....	97	61	81.6	5.15	Monson†.....	91	41	68.8	3.24
Lafayette†.....	94	59	78.4	4.94	Mystic Lake.....	.....	.....	.....	5.41
Linden†.....	99	57	80.8	1.96	Mystic Station.....	.....	.....	.....	5.36
Lionroe†.....	94	61	80.8	3.37	New Bedford a†.....	83	50	66.8	4.26
Litchfield b.....	95	52	78.0	3.70	New Bedford b.....	85	47	68.6	5.22
Lower Iberia.....	93	64	81.2	6.25	Newburyport b.....	.....	.....	.....	3.72



## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<b>Massachusetts—Con.</b>					<b>Minnesota—Cont'd.</b>				
North Billerica <sup>1</sup> .....	97	49	69.6	5.88	Carver <sup>1</sup> .....	93	38	66.0	5.23
Plymouth <sup>1</sup> .....	86	57	69.8	5.80	Clear Lake <sup>1</sup> .....	93	38	66.7	2.50
Provincetown.....	85	55	69.2	4.37	Collegeville.....	92	39	69.4	3.01
Randolph.....	85	55	69.2	5.46	Crookston <sup>1</sup> .....	96	32	65.0	2.52
Roberts Dam.....	88	51	68.6	6.89	Crookston <sup>2</sup> .....	98	48	65.5	2.52
Roxbury.....	88	51	68.6	6.92	Dassel <sup>1</sup> .....	100	46	69.4	2.88
Royalston <sup>1</sup> .....	90	56	67.5	8.00	Fairfield <sup>1</sup> .....	93	45	67.0	2.90
Salem <sup>1</sup> .....	94	48	73.0	5.35	Farmington <sup>1</sup> .....	101	39	68.4	4.00
Salisbury.....	94	48	73.0	5.35	Fergus Falls <sup>1</sup> .....	91	41	64.9	4.54
Somerset <sup>1</sup> .....	93	49	68.3	6.24	Fort Ripley <sup>1</sup> .....	97	35	64.7	3.29
South Dennis <sup>1</sup> .....	93	49	72.3	3.12	Granite Falls.....	94	38	68.6	1.99
Springfield Arm'y.....	91	46	69.4	6.64	Hastings <sup>1</sup> .....	98	51	69.1	1.49
Taunton <sup>1</sup> .....	91	46	69.4	6.64	L. Winnibigoshish <sup>1</sup> .....	87	45	63.2	5.40
Taunton <sup>2</sup> .....	91	43	70.0	5.96	Leech Lake <sup>1</sup> .....	90	43	62.9	4.17
Wakefield <sup>1</sup> .....	90	50	68.9	6.46	Long Prairie <sup>1</sup> .....	93	34	63.5	5.27
Waltham.....	92	40	65.5	4.73	Luverne <sup>1</sup> .....	97	39	68.6	2.92
Wayland <sup>1</sup> .....	91	40	66.7	6.19	Maple Plain.....	93	49	68.0	1.82
Webster.....	93	45	70.4	4.27	Milan <sup>1</sup> .....	100	42	68.4	6.80
Westboro <sup>1</sup> .....	86	54	67.7	5.84	Minneapolis <sup>1</sup> .....	96	40	68.4	2.79
Williamstown <sup>1</sup> .....	86	54	67.7	5.84	Minneapolis <sup>2</sup> .....	94	41	67.6	3.16
Winchendon <sup>1</sup> .....	91	51	68.8	5.90	Minnesota City <sup>1</sup> .....	91	45	66.7	6.58
Winchester.....	91	51	69.4	3.60	Montevideo <sup>1</sup> .....	92	40	68.4	2.71
Winthrop.....	90	50	68.7	3.27	Morris <sup>1</sup> .....	95	40	69.3	2.62
Worcester <sup>1</sup> .....	90	50	68.7	3.27	New London.....	91	37	64.0	5.15
Worcester <sup>2</sup> .....	90	50	68.7	3.27	New Ulm <sup>1</sup> .....	89	47	65.4	4.04
<b>Michigan.</b>					Ortonville <sup>1</sup> .....	89	34	61.6	2.02
Adrian.....	79	42	70.0	1.13	Park Rapids <sup>1</sup> .....	91	37	64.0	4.65
Albion <sup>1</sup> .....	91	43	70.2	0.47	Pine River <sup>1</sup> .....	90	42	66.6	3.57
Allegan.....	97	35	71.0	0.35	Pokegama Falls <sup>1</sup> .....	89	34	61.6	2.16
Alma.....	94	36	65.7	0.84	Rolling Green <sup>1</sup> .....	96	36	67.2	5.91
Ann Arbor <sup>1</sup> .....	92	45	68.6	0.65	Saint Charles <sup>1</sup> .....	94	30	66.1	1.62
Arbela <sup>1</sup> .....	91	45	66.4	0.51	Saint Cloud <sup>1</sup> .....	96	42	67.2	4.99
Ball Mountain.....	91	45	66.4	0.79	Saint Olof <sup>1</sup> .....	90	44	65.5	1.62
Bear Lake.....	94	34	63.6	0.74	Saint Peter <sup>1</sup> .....	95	37	69.6	4.99
Bellaire.....	96	36	64.8	0.96	Sandy Lake Dam <sup>1</sup> .....	87	37	65.9	2.28
Benton Harbor.....	94	39	67.0	0.42	Sauk Center <sup>1</sup> .....	90	36	62.6	7.65
Berlin <sup>1</sup> .....	97	42	68.1	1.19	Wabasha <sup>1</sup> .....	91	45	69.1	3.37
Berrien Springs <sup>1</sup> .....	99	48	69.1	0.30	Wadena <sup>1</sup> .....	87	35	65.4	1.31
Berrien Springs <sup>2</sup> .....	95	34	66.6	0.71	Winona <sup>1</sup> .....	93	40	65.3	1.31
Birmingham <sup>1</sup> .....	93	47	68.6	1.19	<b>Mississippi.</b>				
Boon.....	91	33	62.1	1.42	Aberdeen <sup>1</sup> .....	97	52	77.2	1.73
Brownson.....	95	36	69.2	1.07	Agricultural College <sup>1</sup> .....	95	62	79.5	2.89
Brown City.....	94	44	66.5	1.85	Batesville <sup>1</sup> .....	95	54	77.7	3.02
Calumet.....	87	44	62.8	1.37	Biloxi <sup>1</sup> .....	92	67	80.4	6.15
Charlevoix.....	95	45	67.2	1.16	Bixby <sup>1</sup> .....	93	67	79.6	5.20
Climax <sup>1</sup> .....	94	44	69.2	0.32	Briars.....	99	56	79.6	2.87
Clinton.....	97	41	69.4	1.64	Brookhaven <sup>1</sup> .....	91	62	78.9	2.33
Crystal Falls.....	90	37	61.7	2.58	Canton <sup>1</sup> .....	95	60	79.0	3.40
East.....	94	34	65.9	2.11	Clarksdale <sup>1</sup> .....	102	58	80.2	4.53
Fairview.....	96	44	68.1	1.32	Columbus <sup>1</sup> .....	96	58	78.6	2.33
Fitchburg.....	92	37	66.0	0.89	Columbus <sup>2</sup> .....	101	59	80.8	4.15
Flint.....	98	36	68.6	0.60	Corinth <sup>1</sup> .....	92	58	78.0	7.45
Gaylord.....	91	36	64.2	0.57	Crystal Springs <sup>1</sup> .....	95	62	80.0	6.50
Glenwood.....	86	34	63.2	0.93	Duck Hill <sup>1</sup> .....	94	57	78.2	6.79
Grape.....	93	49	70.0	1.27	Edwards.....	93	62	78.8	2.87
Grayling.....	95	31	64.4	0.95	Enterprise <sup>1</sup> .....	94	57	78.2	2.79
Hanover.....	93	42	69.2	0.59	Fayette <sup>1</sup> .....	93	62	78.8	2.87
Harbor Springs <sup>1</sup> .....	93	39	65.1	1.57	Greenville <sup>1</sup> .....	93	64	80.8	2.79
Harrisville.....	93	49	63.4	1.88	Greenville <sup>2</sup> .....	92	66	79.8	8.04
Hart.....	88	36	63.2	1.90	Hazlehurst <sup>1</sup> .....	97	58	79.8	6.11
Hastings.....	92	40	67.8	0.44	Henderson <sup>1</sup> .....	95	59	79.0	0.42
Hayes.....	91	39	65.8	1.13	Holly Springs <sup>1</sup> .....	98	58	78.3	1.39
Howell.....	97	37	67.8	0.75	Itta Bena <sup>1</sup> .....	97	62	80.6	3.08
Jeddo <sup>1</sup> .....	94	48	66.8	0.97	Jackson <sup>1</sup> .....	96	59	80.2	4.14
Kalamazoo.....	94	48	71.1	0.75	Kosciusko <sup>1</sup> .....	93	59	78.4	1.82
Lansing <sup>1</sup> .....	94	42	68.0	0.73	Lake <sup>1</sup> .....	98	58	78.5	6.63
Lathrop <sup>1</sup> .....	94	46	68.0	0.80	Logtown <sup>1</sup> .....	94	53	80.3	3.39
Lewiston.....	96	43	68.2	1.42	Louisville <sup>1</sup> .....	94	56	78.4	2.06
Lodi.....	95	37	65.2	1.26	Macon <sup>1</sup> .....	100	50	76.2	6.57
Madison.....	92	45	68.6	0.96	Moss Point <sup>1</sup> .....	97	67	83.1	15.75
Marshall <sup>1</sup> .....	96	40	69.2	0.68	Natchez <sup>1</sup> .....	95	62	80.0	3.66
Mayville.....	92	47	68.0	0.70	Okolona <sup>1</sup> .....	98	56	79.1	3.35
Mio.....	96	36	67.6	0.47	Palo Alto <sup>1</sup> .....	96	62	79.2	3.83
Mottville.....	100	37	70.2	0.47	Pontotoc <sup>1</sup> .....	97	59	78.4	4.70
North Marshall.....	92	38	66.6	0.51	Port Gibson <sup>1</sup> .....	97	54	78.6	3.74
Ovid.....	94	40	67.8	1.41	Stonington <sup>1</sup> .....	92	64	79.6	7.20
Paris.....	98	31	63.6	0.53	Thornton <sup>1</sup> .....	91	68	80.6	2.60
Parkville.....	95	50	68.7	2.50	Topton <sup>1</sup> .....	91	64	79.5	1.32
Rawsonville <sup>1</sup> .....	92	40	63.6	1.06	University <sup>1</sup> .....	98	57	80.0	4.99
Saint Ignace.....	95	44	67.0	2.17	Vaiden <sup>1</sup> .....	100	54	79.0	0.72
Sand Beach.....	95	44	67.0	0.50	Water Valley <sup>1</sup> .....	101	59	79.2	2.68
Stanton.....	95	37	67.0	0.86	Waynesboro <sup>1</sup> .....	95	56	79.8	4.44
Stockbridge.....	97	43	69.2	0.92	Waynesboro <sup>2</sup> .....	96	58	79.8	2.68
Thornville <sup>1</sup> .....	91	43	68.6	0.90	Woodville <sup>1</sup> .....	96	62	80.1	4.50
Thornville <sup>2</sup> .....	96	36	68.0	1.66	Yazoo City <sup>1</sup> .....				4.78
Williamston <sup>1</sup> .....	90	42	68.1	0.70	<b>Missouri.</b>				
Ypsilanti <sup>1</sup> .....	93	40	66.9	2.30	Akron.....	96	48	74.0	4.09
<b>Minnesota.</b>					Appleton City <sup>1</sup> .....	96	48	74.0	1.29
Albert Lea <sup>1</sup> .....	94	39	66.7	3.33	Arlington <sup>1</sup> .....	96	48	74.0	2.31
Alexandria <sup>1</sup> .....	90	40	65.0	5.04	Arthur <sup>1</sup> .....	97	53	70.8	2.08
Alexandria <sup>2</sup> .....	90	40	65.0	5.04	Bethany.....	97	40	70.5	4.02
Alma City <sup>1</sup> .....	94	34	66.1	2.66	Big Piney.....	92	49	73.1	3.90
Barrett <sup>1</sup> .....	90	48	61.0	3.19	Birch Tree.....	92	49	73.1	3.90
Beardsley <sup>1</sup> .....	101	34	68.8	3.19	Boonville <sup>1</sup> .....	90	48	72.0	0.71
Belle Plaine <sup>1</sup> .....	99	50	69.8	3.41	Brunswick.....	90	48	72.0	1.00
Bingham Lake <sup>1</sup> .....	94	37	67.8	2.19	Cabool.....	95	59	78.8	3.07
Bird Island.....	94	42	67.2	4.15	Canton.....	95	59	78.8	1.58
Blooming Prairie <sup>1</sup> .....	93	42	67.5	4.15	Cape Girardeau <sup>1</sup> .....	92	49	72.9	1.00
Bonniwells Mills <sup>1</sup> .....	95	42	68.4	3.65	Carrollton <sup>1</sup> .....	92	49	72.9	1.33
Cambridge <sup>1</sup> .....	97	32	65.8	2.85	Carthage <sup>1</sup> .....	92	49	72.9	4.18
Camden <sup>1</sup> .....	97	36	65.3	1.38					

## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Missouri—Cont'd.</i>	°	°	°	<i>Ins.</i>	<i>Nebraska.</i>	°	°	°	<i>Ins.</i>
Conception <sup>1</sup> .....	90	46	71.4	4.75	Agee <sup>1</sup> .....	101	37	73.1	0.44
Cowgill.....	90	46	71.4	2.12	Arberville <sup>1</sup> .....	102	42	71.6	3.45
Dadeville <sup>1</sup> .....	95	40	72.4	1.71	Ashland <sup>1</sup> .....	98	45	71.6	0.43
Darksville <sup>1</sup> .....	95	40	72.4	1.62	Ashton <sup>1</sup> .....	96	42	70.8	0.43
Dixon.....	92	50	75.5	3.15	Basett <sup>1</sup> .....	93	38	67.8	1.48
Downing.....	92	50	75.5	2.51	Beatrice <sup>1</sup> .....	96	47	73.3	6.53
Dumas <sup>1</sup> .....	92	50	75.5	1.75	Beaver City.....	92	41	70.2	3.57
East Lynne <sup>1</sup> .....	92	49	70.6	1.39	Burwell <sup>1</sup> .....	98	58	78.0	2.18
Edge Hill <sup>1</sup> .....	92	52	66.6	1.00	Callaway <sup>1</sup> .....	95	35	68.4	1.28
Edna.....	97	48	75.6	2.05	Columbus <sup>1</sup> .....	93	40	68.4	1.72
Eight Mile <sup>1</sup> .....	94	46	71.1	1.14	Cornelia <sup>1</sup> .....	97	35	67.7	1.15
Eldon <sup>1</sup> .....	96	50	73.2	1.80	Creighton <sup>1</sup> .....	95	35	67.7	1.06
Emma <sup>1</sup> .....	96	54	73.8	1.10	Crete.....	94	45	71.0	3.76
Fairport.....	96	54	73.8	6.17	Culbertson <sup>1</sup> .....	95	48	67.6	4.48
Farmersville.....	100	47	76.0	3.54	David City <sup>1</sup> .....	95	48	67.6	3.20
Fayette.....	90	47	76.0	1.08	De Soto <sup>1</sup> .....	95	37	71.2	1.67
Fox Creek <sup>1</sup> .....	90	54	72.7	1.93	Ericson <sup>1</sup> .....	102	52	73.8	2.34
Fullerton.....	94	49	72.8	1.94	Ewing <sup>1</sup> .....	95	48	67.6	1.55
Gainesville.....	94	49	72.8	3.38	Fairbury <sup>1</sup> .....	96	50	74.0	4.59
Gallatin <sup>1</sup> .....	91	52	75.4	4.28	Fort Robinson.....	96	37	69.7	1.40
Gayoso.....	95	45	73.0	0.92	Fort Sidney.....	102	43	68.8	1.96
Glasgow <sup>1</sup> .....	95	45	73.0	0.54	Franklin <sup>1</sup> .....	97	40	71.8	3.95
Glensted.....	95	45	73.0	2.28	Fremont <sup>1</sup> .....	95	46	70.9	5.51
Gordonville <sup>1</sup> .....	96	56	70.8	1.68	Geneva <sup>1</sup> .....	96	42	72.6	5.79
Gorin <sup>1</sup> .....	95	53	71.3	1.89	Genoa <sup>1</sup> .....	97	45	71.1	1.40
Grove Dale.....	95	40	70.4	2.55	Gering <sup>1</sup> .....	97	44	69.7	2.29
Harrisonville <sup>1</sup> .....	95	50	76.0	1.92	Glenwood <sup>1</sup> .....	97	46	66.5	2.16
Hastain.....	93	42	69.2	0.48	Haigler <sup>1</sup> .....	95	60	72.0	0.00
Hermann <sup>1</sup> .....	95	40	69.9	2.33	Hartington <sup>1</sup> .....	95	35	69.0	2.57
Houston.....	91	40	69.9	1.04	Harvard <sup>1</sup> .....	100	47	71.4	3.52
Humansville.....	95	41	72.2	0.27	Hay Springs <sup>1</sup> .....	99	37	68.1	1.06
Ironton <sup>1</sup> .....	90	51	69.6	2.36	Hebron <sup>1</sup> .....	96	41	72.2	3.85
Jefferson City <sup>1</sup> .....	94	45	72.2	2.20	Holdrege <sup>1</sup> .....	95	51	72.0	2.04
Kidder.....	92	46	70.9	4.16	Imperial <sup>1</sup> .....	96	58	76.0	1.75
Lamar <sup>1</sup> .....	95	48	75.0	2.05	Indianola <sup>1</sup> .....	110	40	73.4	1.33
Lamonte <sup>1</sup> .....	95	48	75.0	0.91	Kennedy <sup>1</sup> .....	93	52	68.7	0.26
Lebanon.....	90	47	71.9	2.35	Kimball <sup>1</sup> .....	99	38	70.0	0.96
Lexington <sup>1</sup> .....	92	45	71.6	0.86	Lexington <sup>1</sup> .....	96	39	72.6	1.78
Liberty.....	97	47	76.0	2.39	Lincoln <sup>1</sup> .....	96	45	72.0	5.51
Louisiana Bridge <sup>1</sup> .....	95	45	72.0	0.35	Lynch <sup>1</sup> .....	97	38	72.1	0.73
McCune <sup>1</sup> .....	93	58	72.2	0.69	Madrid <sup>1</sup> .....	93	43	69.4	2.20
Malden.....	95	45	72.0	0.80	Marquette <sup>1</sup> .....	94	41	72.0	2.35
Mansfield.....	95	45	72.0	3.92	Minden <sup>1</sup> .....	94	46	70.2	1.83
Marceline.....	95	45	72.0	1.85	Mullen <sup>1</sup> .....	90	45	70.5	0.25
Marshall <sup>1</sup> .....	96	46	71.3	0.79	Nebraska City <sup>1</sup> .....	88	44	68.4	3.57
Mexico <sup>1</sup> .....	97	47	74.8	1.24	Nesbit <sup>1</sup> .....	98	35	68.8	1.67
Miami <sup>1</sup> .....	92	50	71.6	0.76	Norfolk <sup>1</sup> .....	91	40	70.4	1.76
Mine La Motte.....	91	50	73.2	0.75	North Loup <sup>1</sup> .....	95	37	71.6	1.20
Mount Vernon.....	95	45	72.0	2.87	Oakdale <sup>1</sup> .....	98	35	70.2	1.20
New Hartford <sup>1</sup> .....	95	58	75.8	0.50	Ogallala <sup>1</sup> .....	102	45	72.8	0.67
New Haven <sup>1</sup> .....	95	50	76.5	1.48	O'Neill <sup>1</sup> .....	95	46	70.4	0.62
New Madrid.....	97	56	77.8	1.15	Ough <sup>1</sup> .....	95	40	72.2	1.87
New Palestine.....	95	45	72.0	1.01	Palmer <sup>1</sup> .....	96	40	72.2	3.95
Oakfield <sup>1</sup> .....	93	52	74.8	1.08	Plattsmouth <sup>1</sup> .....	99	42	72.3	4.62
Oak Ridge <sup>1</sup> .....	95	53	71.0	0.90	Ponca <sup>1</sup> .....	99	42	72.3	0.85
Olden <sup>1</sup> .....	94	51	73.1	1.96	Ravenna <sup>1</sup> .....	93	36	70.6	0.85
Oregon <sup>1</sup> .....	92	47	72.0	6.11	Red Cloud.....	95	40	72.2	2.24
Oregon <sup>1</sup> .....	92	46	71.4	5.80	Santee Agency <sup>1</sup> .....	99	40	72.2	1.75
Oreola.....	95	45	72.0	0.79	Seward <sup>1</sup> .....	100	48	73.3	6.22
Oto.....	95	45	72.0	5.00	Stanton <sup>1</sup> .....	95	40	69.3	1.70
Palmyra.....	94	40	71.8	1.50	State Farm <sup>1</sup> .....	101	42	70.8	6.39
Panacea.....	92	40	71.8	3.00	Superior <sup>1</sup> .....	94	51	73.3	2.37
Phillipsburg <sup>1</sup> .....	94	54	73.5	2.35	Sutton <sup>1</sup> .....	94	42	71.4	6.40
Pickering <sup>1</sup> .....	94	43	67.8	5.55	Syracuse <sup>1</sup> .....	98	53	72.5	5.40
Platte River <sup>1</sup> .....	94	46	73.7	4.48	Table Rock <sup>1</sup> .....	98	42	72.8	7.91
Princeton <sup>1</sup> .....	99	43	71.2	3.54	Tecumseh <sup>1</sup> .....	95	42	72.0	4.68
Rea <sup>1</sup> .....	95	40	69.6	6.63	Tekamah.....	95	39	68.2	3.55
Rolla <sup>1</sup> .....	95	40	69.6	2.23	Turlington <sup>1</sup> .....	103	63	76.6	6.17
Round Springs.....	95	40	69.6	0.96	Wallace <sup>1</sup> .....	94	52	68.7	6.70
Saint Charles <sup>1</sup> .....	92	51	73.3	1.03	Weeping Water <sup>1</sup> .....	99	38	66.0	5.22
Saint Joseph <sup>1</sup> .....	91	47	71.8	5.81	West Point <sup>1</sup> .....	97	42	72.6	4.80
Saint Louis <sup>1</sup> .....	91	47	71.8	1.06	Whitman <sup>1</sup> .....	90	46	65.8	0.61
Sarcobea <sup>1</sup> .....	101	54	78.6	2.93	Wilcox <sup>1</sup> .....	95	40	72.2	3.73
Sedalia.....	94	48	74.2	1.29	York <sup>1</sup> .....	98	50	72.4	3.70
Shelbina.....	95	40	71.8	1.50	<i>Nevada.</i>				
Steelville.....	95	40	71.8	0.86	Austin.....	89	49	67.8	0.60
Steffenville.....	95	40	71.8	1.90	Battle Mountain <sup>1</sup> .....	97	60	72.9	0.00
Stellada <sup>1</sup> .....	97	45	74.0	1.79	Bellville <sup>1</sup> .....	100	60	73.0	0.03
Sublett <sup>1</sup> .....	93	52	70.8	3.17	Belmont.....	85	49	65.8	0.58
Tindall <sup>1</sup> .....	95	46	74.3	3.03	Beowawe <sup>1</sup> .....	100	58	78.0	0.20
Unionville <sup>1</sup> .....	95	46	74.3	4.22	Candelaria.....	96	55	75.2	0.34
Vernon <sup>1</sup> .....	95	46	74.3	2.04	Carlin <sup>1</sup> .....	96	45	70.9	0.00
Vermont <sup>1</sup> .....	91	50	71.4	1.33	Carson City <sup>1</sup> .....	94	38	66.0	0.11
Wells.....	95	40	71.8	5.21	Cranes Ranch.....	95	40	72.2	0.14
Virgil City.....	95	40	71.8	1.80	Downeyville.....	104	50	78.4	0.62
Warrensburg <sup>1</sup> .....	95	52	73.8	0.91	Edgewood.....	89	34	62.6	0.21
Warrenton.....	95	40	71.8	1.44	Elko <sup>1</sup> .....	103	40	68.1	0.00
Wheatland.....	95	40	71.8	0.20	Elko (near) <sup>1</sup> .....	103	42	68.8	0.00
Whiteside.....	93	49	72.5	0.61	Ely.....	95	40	72.2	0.85
<i>Montana.</i>					Fenelon <sup>1</sup> .....	120	50	75.6	0.00
Boulder <sup>1</sup> .....	93	36	62.9	0.35	Genoa.....	94	49	71.9	0.67
Camp Poplar River <sup>1</sup> .....	108	33	67.2	0.40	Golconda <sup>1</sup> .....	100	58	75.7	0.00
Fort Fork <sup>1</sup> .....	106	35	64.0	0.43	Halleck <sup>1</sup> .....	108	52	71.4	0.00
Glick Park <sup>1</sup> .....	99	21	55.5	0.46	Hawthorne <sup>1</sup> .....	93	65	77.9	0.00
Fort Custer <sup>1</sup> .....	100	42	72.9	0.00	Hawthorne <sup>1</sup> .....	95	50	74.0	0.07
Fort Keogh.....	108	37	71.6	0.10	Hot Springs <sup>1</sup> .....	100	70	84.8	0.00
Fort Missoula.....	101	32	62.6	0.65	Humboldt <sup>1</sup> .....	99	60	75.5	T.
Glenlivet <sup>1</sup> .....	113	41	72.5	0.53	Lewers Ranch.....	92	43	68.6	T.
Glasgow.....	110	30	68.8	0.00	Lovelock <sup>1</sup> .....	104	60	76.9	0.00
Great Falls <sup>1</sup> .....	99	35	66.8	0.11	McDermitt.....	102	31	66.9	0.00
Jogan <sup>1</sup> .....	99	38	67.4	0.70	Mill City <sup>1</sup> .....	104	58	73.4	0.00
Lorr <sup>1</sup> .....	95	35	64.1	1.34	Monitors Ranch.....	93	31	64.6	0.93
Lartinsdale <sup>1</sup> .....	104	29	68.4	0.11	Palisade <sup>1</sup> .....	104	46	78.0	0.00
Linguaville <sup>1</sup> .....	108	31	67.5	0.77	Palmetto.....	91	33	66.4	1.27
Virginia City <sup>1</sup> .....	91	38	64.2	0.70	Pioche.....	98	49	72.7	0.16

## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Nevada—Cont'd.</i>	°	°	°	<i>Ins.</i>	<i>New Mexico—Cont'd.</i>	°	°	°	<i>Ins.</i>
Reno <sup>2</sup> .....	96	58	73.8	0.10	Embudo.....	103	48	73.4	2.37
Reno State Univ'ty.....	94	41	68.6	0.04	Fort Bayard.....	92	49	70.3	4.90
Saint Clair.....	93	49	71.4	0.00	Fort Wingard.....	93	31	62.4	0.00
Stofel.....	98	35	59.2	0.22	Gallinas Spring f.....	97	50	74.0	2.58
Sunnyside.....	99	40	73.7	0.23	Halls Peak f.....	84	37	59.3	4.79
Tecoma <sup>2</sup> .....	102	58	72.8	T.	La Luz f.....	88	55	71.8	3.90
Toano <sup>2</sup> .....	102	54	72.2	0.00	Las Cruces f.....	96	51	78.2	4.19
Tybo.....	94	43	69.5	0.89	Lordsburg <sup>2</sup> .....	100	70	81.3	2.36
Verdi <sup>2</sup> .....	93	50	70.2	0.14	Los Lunas f.....	94	40	65.3	2.50
Virginia City.....	90	54	73.4	0.02	Monero f.....	88	39	62.0	3.86
Wadsworth <sup>2</sup> .....	101	68	76.4	T.	Olito f.....	98	49	74.3	0.42
Wells <sup>2</sup> .....	100	51	72.2	0.00	Socorro f.....	94	57	75.8	1.11
Winnemucca <sup>2</sup> .....	95	44	67.6	0.18	Springer f.....	94	57	75.8	5.27
<i>New Hampshire.</i>	°	°	°	°	<i>Thos f.....</i>	97	41	65.2	2.29
Alstead <sup>2</sup> .....	86	48	65.8	4.75	<i>New York.</i>	°	°	°	°
Antrim.....	88	48	65.8	4.75	Addison <sup>1</sup> .....	92	40	66.5	3.69
Belmont.....	88	48	65.8	4.75	Alfred Center <sup>1</sup> .....	93	40	65.1	4.95
Berlin Mills.....	88	48	65.8	4.75	Angelica <sup>1</sup> .....	93	40	65.1	5.22
Bethlehem.....	88	48	65.8	4.75	Arcade <sup>1</sup> .....	90	39	64.3	6.55
Brookline <sup>2</sup> .....	87	47	65.2	8.09	Arkwright.....	93	49	65.8	6.55
Concord <sup>2</sup> .....	86	45	65.0	4.11	Atlanta.....	93	49	67.6	7.47
Durham.....	86	47	65.2	8.36	Baldwinsville <sup>1</sup> .....	93	49	67.6	5.15
East Canterbury.....	86	45	65.0	3.48	Bedford.....	93	40	66.8	7.72
Grafton <sup>1</sup> .....	85	40	63.8	7.21	Binghamton <sup>1</sup> .....	93	40	66.8	4.88
Hanover <sup>2</sup> .....	85	41	64.8	4.85	Bolivar.....	93	40	66.8	4.12
Keene.....	81	38	60.3	8.90	Boonville.....	93	40	66.8	7.19
Lakeport.....	93	39	65.5	4.32	Bovine Center.....	93	40	66.8	10.16
Lancaster.....	93	39	65.5	4.32	Brentwood <sup>1</sup> .....	88	46	69.8	7.19
Littleton <sup>1</sup> .....	89	36	62.7	4.56	Brookfield <sup>1</sup> .....	92	38	64.8	6.65
Manchester <sup>1</sup> .....	95	48	69.2	4.62	Castile.....	92	38	64.8	7.34
Mine Falls.....	95	48	69.2	4.62	Central Park, N. Y.....	93	56	73.5	8.72
Nashua.....	96	44	69.2	4.86	Cherry Creek.....	93	56	73.5	5.75
Newton.....	91	44	67.2	4.75	Constableville <sup>1</sup> .....	88	40	63.6	6.00
North Conway.....	96	43	68.2	6.04	Cooperstown <sup>1</sup> .....	89	38	64.3	7.59
Pennichuck Station.....	94	36	66.4	4.44	Cortland.....	85	45	65.9	9.17
Peterboro.....	94	36	66.4	4.44	De Kalb Junction.....	94	43	67.2	4.80
Plymouth <sup>1</sup> .....	95	42	64.3	6.01	Demeter.....	83	50	66.9	5.60
Sanbornton f.....	89	44	65.4	3.81	Dunkirk.....	83	50	66.9	5.60
Stratford.....	99	35	67.6	2.31	Easton.....	90	37	68.2	5.95
Wier Bridge.....	99	35	67.6	2.31	Elen Center.....	90	37	68.2	5.95
West Milan.....	90	35	64.0	4.46	Elmira <sup>2</sup> f.....	90	37	68.2	5.95
Wolfboro.....	90	35	64.0	4.46	Factoryville f.....	97	34	68.8	5.29
<i>New Jersey.</i>	°	°	°	°	Fleming <sup>1</sup> .....	94	48	69.2	2.01
Allaire.....	91	48	70.4	.....	Fort Niagara f.....	97	56	71.6	4.85
Anby Park.....	91	54	72.7	8.67	Friendship <sup>1</sup> .....	93	37	64.6	5.33
Barnegat.....	89	53	70.8	4.14	Geneva <sup>1</sup> .....	94	47	68.7	4.53
Bayonne.....	96	54	74.5	6.44	Gloversville <sup>1</sup> .....	94	47	68.7	4.53
Belvidere.....	97	46	72.4	11.94	Hess Road Station <sup>1</sup> .....	94	47	68.7	4.53
Beverly f.....	96	52	71.8	5.49	Honeybrook Brook <sup>1</sup> .....	88	43	68.4	5.34
Billingsport <sup>2</sup> .....	93	61	74.8	2.54	Humphrey f.....	90	42	66.5	5.82
Boonton.....	93	61	74.8	2.54	Ithaca <sup>1</sup> .....	91	43	67.2	3.86
Bridgeport.....	94	58	76.1	4.38	Jamestown <sup>2</sup> .....	91	43	67.2	3.86
Camden.....	91	55	73.8	4.24	Kings Station.....	91	37	67.4	5.93
Cape May C. H.....	88	55	72.6	4.89	Lebanon Springs.....	92	46	67.0	4.89
Charlotteburg.....	93	38	68.8	7.02	Le Roy.....	92	46	67.0	4.89
Chester.....	88	49	70.4	7.85	Liberty.....	93	49	67.0	4.89
Dockertown.....	96	47	71.1	8.60	Little Valley.....	94	46	68.9	5.21
Dover.....	94	41	69.0	6.22	Lockport.....	94	46	68.9	5.21
Egg Harbor City <sup>1</sup> .....	93	50	71.1	6.94	Lowville.....	94	43	65.2	8.65
Elizabeth <sup>1</sup> .....	93	51	74.3	6.49	Lyons <sup>1</sup> .....	92	51	68.8	7.89
Franklin Furnace.....	93	42	69.4	7.89	Lyon Mountain.....	84	45	63.6	9.00
Franklinville.....	93	48	72.4	6.34	Madison Barracks f.....	97	40	69.0	9.00
Friedhold.....	91	51	72.2	4.67	Malone <sup>1</sup> .....	90	40	65.0	9.08
Gillette.....	95	43	71.6	4.94	Middletown.....	94	47	71.4	5.68
Hanover.....	91	49	71.5	6.79	Minneaska <sup>1</sup> .....	87	50	68.4	4.66
Highland Park f.....	95	50	73.4	9.81	Mount Morris.....	95	39	66.8	5.20
Hightstown <sup>1</sup> .....	90	53	71.5	5.81	Newark Valley.....	89	45	66.4	5.17
Imlaystown.....	95	51	74.6	4.50	Newfield Summit.....	89	45	66.4	5.17
Lambertville.....	91	49	73.0	6.60	New Lisbon <sup>1</sup> .....	90	35	63.8	8.38
Locktown.....	95	49	73.0	7.84	North Hammond f.....	90	35	63.8	8.38
Millville.....	95	54	75.9	4.98	Number Four f.....	88	36	63.4	6.03
Moorestown <sup>1</sup> .....	91	51	72.6	4.79	Ogdenburg f.....	93	49	68.0	5.69
Newark <sup>2</sup> .....	90	54	73.8	6.56	Oxford.....	91	40	67.3	7.37
New Brunswick.....	94	50	73.5	10.70	Palermo f.....	98	40	67.2	5.51
New Brunswick b.....	93	53	73.8	11.17	Perry City <sup>1</sup> .....	95	40	65.6	5.21
Newton <sup>1</sup> .....	94	44	71.4	5.86	Phoenix.....	95	40	65.6	5.21
Ocean City.....	87	57	73.0	6.72	Pine City.....	87	48	65.4	4.20
Oceanic.....	92	58	75.8	6.47	Plattsburg Hks.....	87	48	65.4	4.20
Paterson.....	95	52	73.8	7.43	Port Jervis.....	90	45	70.8	5.03
Pensauken.....	96	50	73.5	7.33	Potsdam.....	89	44	66.7	9.92
Plainfield.....	96	50	73.5	7.33	Poughkeepsie.....	96	41	70.3	4.11
Rancocas <sup>2</sup> .....	93	50	71.8	3.80	Rome.....	93	44	68.5	6.68
Readington <sup>2</sup> .....	94	42	71.8	4.87	Romulus.....	96	47	70.5	4.15
River Vale <sup>1</sup> .....	99	42	71.8	4.87	Setauket f.....	88	56	70.3	6.05
Salem.....	90	52	75.2	7.44	South Canisteo <sup>1</sup> .....	93	36	64.1	4.13
Somerville.....	98	50	74.8	8.32	South Kortright f.....	90	33	64.1	7.26
South Orange <sup>1</sup> .....	91	33	71.5	7.16	Stillwater <sup>1</sup> .....	89	45	68.4	8.08
Tenafly <sup>1</sup> .....	90	44	70.8	8.04	Turin.....	89	45	68.4	7.09
Toms River.....	93	46	71.7	6.40	Utica.....	96	40	68.3	6.57
Trenton.....	92	55	75.5	5.60	Varysburg.....	93	40	66.8	5.77
Vineyard.....	98	50	74.7	4.89	Wappingers Falls.....	93	48	71.3	6.04
West Summit.....	90	50	71.1	5.18	Watertown.....	91	45	68.0	9.20
Whiting.....	96	49	73.2	3.59	Watkins <sup>1</sup> .....	92	50	71.7	3.35
Woodbine.....	91	50	71.8	5.18	Wedgwood <sup>1</sup> .....	96	45	66.2	5.61
<i>New Mexico.</i>	°	°	°	°	West Chazy.....	94	45	74.3	6.62
Albert f.....	97	52	74.4	4.79	West Point f.....	94	45	74.3	7.05
Albuquerque f.....	91	55	73.0	1.88	Willea Point.....	90	45	72.3	7.05
Chama f.....	89	43	64.2	3.62	<i>North Carolina.</i>	°	°	°	°
Conditge f.....	91	45	66.4	1.50	Asheville <sup>1</sup> .....	88	52	70.4	6.24
Deming <sup>2</sup> .....	99	46	80.3	4.38	Bailey.....	88	44	67.9	8.11
East Las Vegas f.....	84	46	65.4	6.97	Bakersville f.....	84	41	66.6	7.67

## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>N. Carolina—Cont'd.</i>					<i>Ohio—Cont'd.</i>				
Columbus.....	85	54	67.8	14.39	Cherry Fork.....	96	46	73.4	1.29
Douglas.....	99	52	75.8	11.20	Cheshire.....	98	39	70.6	2.33
Experiment <sup>1</sup> Farm.....	91	60	76.7	6.13	Chicago.....	98	39	70.6	0.77
Fayetteville f.....	90	60	77.2	5.80	Circleville <sup>1</sup> .....	98	39	70.6	1.16
Flat Rock.....	85	50	69.2	10.15	Clarksville <sup>1</sup> .....	93	48	72.3	1.77
Goldsboro f.....	90	60	77.2	5.80	Cleveland <sup>1</sup> .....	91	48	68.4	3.25
Greensboro f.....	94	62	76.9	10.75	Coalton.....	100	40	71.8	1.64
Henderson f.....	96	60	74.6	6.96	Colebrook.....	95	49	73.8	3.72
Highlands <sup>1</sup> .....	79	49	64.3	12.35	Dayton <sup>1</sup> .....	95	49	73.8	0.89
Horse Cove f.....	85	55	68.9	8.31	Dayton f.....	92	50	70.4	3.76
Lenoir <sup>1</sup> .....	89	54	72.1	7.50	Demos.....	92	50	70.4	3.76
Lewiston.....	97	59	70.8	6.42	Dupont <sup>1</sup> .....	93	41	70.3	1.59
Littleton f.....	97	59	70.8	6.42	Ellsworth.....	91	43	67.4	2.69
Louisburg f.....	88	59	75.2	4.87	Elyria.....	98	47	69.8	2.87
Lumberton f.....	93	62	78.4	8.15	Findlay <sup>1</sup> .....	94	43	69.7	2.50
Lynn <sup>2</sup> f.....	88	59	71.3	9.45	Fostoria <sup>1</sup> .....	94	49	72.7	1.50
Marion.....	94	50	72.2	6.91	Frankfort.....	94	44	72.0	0.94
Mocksville <sup>1</sup> .....	92	60	75.2	11.22	Garrettsville <sup>1</sup> .....	93	40	65.5	3.04
Morganton <sup>2</sup> f.....	93	52	73.2	9.37	Georgetown <sup>1</sup> .....	95	57	73.5	1.23
Mount Airy f.....	95	48	72.8	6.21	Gratiot.....	93	45	69.6	1.13
Mount Holly f.....	91	59	75.0	9.09	Greenfield.....	94	50	71.6	0.80
Mount Pleasant.....	91	59	75.0	9.09	Green Hill.....	97	39	68.2	2.79
Murphy f.....	87	56	71.4	9.33	Greenville <sup>1</sup> .....	88	48	70.1	0.97
Newbern f.....	93	54	74.0	8.26	Guysville.....	94	50	71.4	4.05
Oak Ridge f.....	87	59	74.0	5.10	Hackney.....	94	48	71.4	3.80
Pittsboro.....	90	63	77.4	5.10	Hanging Rock <sup>1</sup> .....	95	51	70.1	3.54
Raleigh <sup>1</sup> f.....	91	61	77.2	10.16	Harbor.....	90	47	68.8	3.54
Rockingham f.....	90	63	77.4	5.10	Hedges.....	95	39	68.2	3.54
Roxboro f.....	95	57	75.6	8.52	Hillhouse.....	96	42	69.0	2.84
Salisbury <sup>1</sup> .....	90	61	76.7	7.35	Hillsboro.....	96	43	72.0	1.46
Saxon f.....	93	49	72.8	10.87	Hiram <sup>1</sup> .....	92	47	68.4	3.55
Shelby f.....	90	59	75.3	6.35	Jacksonboro <sup>1</sup> .....	97	52	72.1	1.40
Sloan.....	90	58	76.6	11.79	Kenton.....	98	42	71.5	1.82
Smithfield.....	92	58	76.6	5.03	Kilbourne <sup>1</sup> .....	92	42	67.9	1.71
Soapstone M <sup>1</sup> f.....	91	54	74.6	6.89	Killbuck.....	95	42	69.6	2.11
Southern Pines f.....	94	56	75.2	5.12	Leipsic.....	91	50	71.8	2.12
Tarboro.....	95	55	77.6	5.15	Levering.....	94	40	67.4	0.89
Warrenton.....	95	55	77.6	5.15	Logan <sup>1</sup> .....	96	48	70.4	2.02
Washington f.....	95	57	78.5	3.76	Lordstown <sup>1</sup> .....	92	39	66.4	2.56
Weldon <sup>1</sup> .....	94	53	76.4	3.39	Lowell.....	101	42	72.3	3.84
Willeyton.....	93	53	75.6	4.73	McArthur.....	95	45	72.0	4.87
<i>North Dakota.</i>					McConnellsville <sup>1</sup> .....	95	49	70.1	2.74
Ashley.....	102	32	65.4	1.49	Mansfield f.....	95	49	70.1	0.73
Berlin f.....	102	29	66.4	0.69	Marietta a f.....	93	52	72.1	4.13
Bottineau.....	106	32	67.6	0.55	Marietta b f.....	93	52	72.1	3.92
Cannon Ball.....	108	35	70.4	0.66	Marion <sup>1</sup> .....	95	43	68.7	1.06
Churches Ferry.....	103	34	65.8	2.15	Milfordton.....	96	41	71.2	0.92
Dawson f.....	97	33	66.6	1.02	Milligan.....	99	42	71.0	2.44
Dickinson f.....	101	33	68.2	0.46	Millport.....	92	40	68.0	2.86
Dunseith.....	103	41	66.6	0.55	Montpelier <sup>1</sup> .....	97	42	70.0	0.35
Ellendale f.....	101	33	65.6	1.35	Mountville.....	94	44	70.4	2.38
Fargo f.....	94	34	65.4	2.72	Napoleon.....	94	44	70.4	1.50
Forman f.....	102	34	66.7	3.26	Nelsonville.....	98	48	71.6	1.68
Fort Stevenson f.....	101	31	66.3	1.11	New Alexandria <sup>1</sup> .....	91	48	71.6	5.36
Fort Yates f.....	105	34	70.0	0.79	New Berlin.....	97	53	77.2	2.50
Gallatin f.....	101	31	65.4	1.74	New Comerstown <sup>1</sup> .....	94	44	68.5	3.16
Grand Forks f <sup>1</sup> .....	86	32	62.1	1.72	New Holland.....	97	43	70.7	1.65
Jamestown f.....	100	40	67.9	0.93	North Lewisburg <sup>1</sup> .....	95	40	72.0	0.70
Kelso f.....	97	32	66.2	1.68	North Royalton.....	95	45	69.2	4.89
Larimore.....	97	35	64.8	2.20	Northwood <sup>1</sup> .....	98	46	71.7	1.84
Medora f.....	100	34	73.2	0.19	Oberlin <sup>1</sup> .....	96	40	69.5	1.75
Milton f.....	98	35	65.6	1.00	O. S. University <sup>1</sup> .....	93	43	70.7	1.61
Minto f.....	95	36	65.4	2.13	Orangeville.....	94	39	67.6	2.80
Napoleon f.....	104	30	68.0	0.97	Pataskala.....	93	43	70.3	3.23
New Salem.....	108	32	68.9	0.59	Piqua <sup>1</sup> .....	93	49	68.6	0.10
Oakdale f.....	96	39	67.8	0.46	Plattsburg.....	94	45	69.6	1.74
Power f.....	98	38	67.8	1.68	Pomeroy.....	96	50	72.2	2.40
Reynolds.....	98	32	64.0	1.99	Portsmouth a f.....	96	52	71.0	1.07
Saint John f.....	98	37	64.6	1.08	Portsmouth b f.....	96	52	71.0	1.07
Wahpeton f.....	94	33	66.3	3.27	Ridge v <sup>1</sup> e Corners.....	94	42	71.0	3.62
Wild Rice f <sup>1</sup> .....	103	32	64.8	2.37	Ripley.....	94	42	69.6	1.22
Williamsport.....	103	32	68.8	0.45	Rittman.....	92	40	68.2	0.63
Williston.....	106	32	68.8	0.10	Rush Creek.....	92	40	68.2	1.52
Willow City f.....	104	32	66.0	0.82	Sharon Center.....	92	40	68.2	0.95
Woodbridge f.....	97	30	62.0	0.82	Shenandoah.....	97	44	69.9	1.70
<i>Ohio.</i>					Sidney <sup>1</sup> .....	97	44	69.9	0.60
Akron <sup>1</sup> .....	92	47	70.0	2.23	Springboro.....	97	44	69.9	5.23
Annapolis.....	95	43	70.4	4.14	Stoutsville.....	97	44	69.9	3.27
Arcanum.....	90	40	68.0	0.26	Sylvania <sup>1</sup> .....	95	40	69.5	0.68
Ashland <sup>1</sup> .....	90	55	69.9	1.56	Thurman.....	100	49	73.8	2.42
Athens <sup>1</sup> .....	94	46	70.7	1.01	Tiffin f <sup>1</sup> .....	94	49	71.1	1.35
Auburn.....	92	39	65.6	3.91	Tyrone.....	95	48	73.5	3.09
Bangorville <sup>1</sup> .....	94	48	69.7	1.01	Upper Sandusky <sup>1</sup> .....	91	47	70.7	0.94
Batavia.....	96	42	66.7	1.11	Vanceburg.....	96	49	72.7	1.50
Bement.....	96	42	66.7	6.08	Van Wert.....	96	41	70.7	0.41
Benton Ridge.....	100	41	72.3	1.95	Vermilion.....	96	41	70.7	1.90
Bethany.....	95	48	72.4	1.64	Vickery <sup>1</sup> .....	93 <sup>m</sup>	46 <sup>m</sup>	68.6 <sup>m</sup>	0.40
Big Prairie.....	92	43	68.3	2.69	Walnut.....	96	42	69.6	3.27
Binola.....	97	47	72.2	4.53	Warren.....	95	41	69.1	2.52
Bissells.....	94	45	69.4	3.35	Wauseon <sup>1</sup> .....	96 <sup>a</sup>	40 <sup>a</sup>	69.4 <sup>a</sup>	0.49
Bladensburg.....	96	42	68.0	0.79	Waynesville.....	96	49	72.7	2.19
Bloomington.....	93	47	69.9	3.39	Waynesville.....	96	49	72.7	3.46
Bloomington.....	93	47	69.9	3.39	Weston.....	96	49	72.7	2.19
Bowling Green <sup>1</sup> .....	100	40	68.6	1.10	Westerville <sup>1</sup> .....	89	45	68.3	2.35
Bucyrus <sup>1</sup> .....	96	48	70.1	0.95	West Milton.....	100	50	68.0	0.60
Cadiz.....	96	48	70.1	0.95	Weymouth.....	96	40	68.1	2.82
Caledonia f.....	96	48	70.1	0.95	Wheeler f <sup>2</sup> .....	96	40	68.1	4.11
Cambridge.....	93	44	69.2	2.08	Wooster <sup>1</sup> .....	93	37	70.3	1.53
Camp Dennison <sup>1</sup> .....	95	50	69.8	1.07	Wooster b f.....	93	37	70.3	1.53
Canal Dover <sup>1</sup> .....	90	46	68.7	2.75	Youngstown <sup>1</sup> .....	94	42	69.2	2.75
Canton <sup>1</sup> .....	93	46	69.2	2.13	Zanesville f.....	94	42	69.2	2.23
Carrollton.....	98	41	70.2	2.13	<i>Oklaoma Ter.</i>				
Cedarville.....	96	42	68.0	1.44	Anadarko f.....	95	48	76.7	7.36
Cedara <sup>1</sup> .....	91	49	72.8	0.80	Arapahoe.....	92	50	75.6	4.95



## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
Oklahoma—Cont'd.	0	0	0	Ins.	Pennsylvania—Con.	0	0	0	Ins.
Buffalo†	96	58	75.0	12.55	Hollidaysburg†	98	39	70.6	4.18
Burnett†	95	48	75.8	5.84	Honesdale†	87	42	66.5	3.17
Cloud Chief†	105	46	76.8	4.93	Huntingdon†	99	43	70.3	3.49
Fort Reno†	95	49	75.2	10.25	Johnstown†	99	43	70.3	3.49
Fort Sill†	98	50	77.5	4.70	Kennett Square†	99	43	70.3	3.49
Guthrie†	99	54	77.4	4.82	Kilmer†	97	60	75.0	5.19
Keokuk Falls†	96	47	75.8	4.16	Lancaster†	96	50	73.7	3.77
Mangum†	98	52	76.0	3.12	Lansdale†	96	48	71.4	5.30
Ponca†	101	45	78.4	0.83	Lebanon†	96	47	68.3	5.92
Sac & Fox Agency†	95	47	75.2	5.20	Le Roy†	95	37	67.9	2.19
Winnview†	96	48	76.2	7.31	Ligonier†	99	42	69.7	2.82
Oregon.					Lock Haven†	99	42	69.7	2.82
Albany†	97	42	64.7	0.05	Lock No. 4†	99	42	69.7	2.82
Albany b†	94	36	69.0	0.00	Lycippus†	84	54	68.1	1.68
Arlington†	96	46	72.4	0.00	Mahoning†	99	43	66.0	4.48
Ashland a†	94	36	70.1	0.00	Meadville†	89	43	66.0	7.03
Ashland b†	102	39	68.0	0.03	Newcastle†	92	39	66.8	3.37
Aurora a†	97	46	70.2	0.00	Ott City†	92	39	66.8	3.37
Aurora (near)†	94	38	63.7	0.06	Point Pleasant†	92	39	66.8	3.37
Bandon†	67	41	56.0	0.01	Parker†	92	39	66.8	3.37
Beulah†	100	35	67.0	0.00	Philadelphia†	93	56	75.2	3.90
Brownsville a†	96	54	68.8	0.00	Philadelphia b†	93	56	75.2	3.90
Burns†	95	29	63.7	0.00	Phoenixville†	94	52	74.6	3.61
Canyon City†	109	44	74.8	0.00	Point Pleasant†	92	39	66.8	3.37
Comstock†	100	48	64.2	0.00	Pottstown†	95	52	74.8	4.52
Cornelius†	99	44	67.9	0.03	Quakertown†	98	48	70.9	8.90
Corvallis a†	96	39	63.8	0.09	Reading†	98	48	70.9	3.25
Corvallis b†	94	50	66.0	0.00	Ridgway†	94	38	66.1	4.19
East Portland†	95	39	66.0	0.06	Saegertown†	94	38	66.1	5.20
Eugene†	93	27	60.4	0.00	Salem Corners†	92	47	66.9	5.42
Fife†	76	40	60.7	0.30	Salisbury†	97	42	73.8	6.44
Gardiner†	100	34	63.3	0.24	Seisholtzville†	97	42	73.8	4.07
Glenora†	99	36	67.8	0.00	Skippack†	93	47	72.8	5.76
Grants Pass a†	93	49	69.7	0.00	Smithport†	91	37	65.1	4.15
Grants Pass b†	92	41	66.9	0.00	Smiths Corners†	96	42	70.2	8.63
Heppner†	88	44	63.6	0.00	Somers†	90	45	68.0	3.93
Hood River (near)†	93	40	63.6	0.00	South Eaton†	92	30	68.8	5.41
Hubbard†	95	42	67.8	0.00	State College†	92	30	68.8	3.14
Jacksonville†	95	35	63.0	0.03	Stoyestown†	92	30	68.8	2.91
Joseph†	95	35	63.0	0.03	Warren†	90	34	63.2	6.44
Junction City†	95	35	63.0	0.03	Wellsboro†	91	34	63.2	4.59
Lafayette†	102	56	72.6	0.00	West Chester†	91	34	63.2	3.65
La Grande†	100	37	69.2	0.00	West Newton†	97	44	71.3	3.53
Lakeview†	98	35	66.9	0.00	Wilkesbarre†	97	44	71.3	3.76
Langlois†	78	41	62.9	0.00	Wyox†	95	38	68.1	5.43
Leland†	98	44	66.9	0.00	York†	95	47	72.1	3.40
Lone Rock†	95	32	61.6	0.00	Rhode Island.				
Monmouth†	100	52	66.7	0.00	Kingston†	87	48	67.6	5.84
Monmouth b†	94	55	73.5	0.00	Lonsdale†	90	51	70.6	4.61
Mount Angel†	94	38	65.2	0.01	Olneyville†	90	51	70.6	4.61
New Bridge†	108	40	76.8	0.02	Pawtucket†	89	50	69.6	4.06
Newport†	84	32	53.6	0.17	Providence a†	92	53	72.0	4.24
Oregon City†	96	47	69.5	0.07	Providence b†	91	50	69.7	4.26
Pendleton†	101	40	70.0	0.00	South Carolina.				
Portland†	95	50	71.1	0.00	Allendale†	93	66	79.8	12.71
Riddles†	88	40	65.4	0.00	Anderson†	96	63	78.0	5.94
Roseburg†	94	48	69.2	0.00	Batesburg†	96	63	78.0	13.06
Salem a†	85	52	64.6	0.00	Blackburg†	96	63	78.0	13.06
Salem b†	93	40	63.4	0.10	Blackville†	94	64	79.2	10.09
Sheridan†	96	50	68.2	0.06	Blackwell†	90	66	76.0	13.99
Silverton†	92	52	64.9	0.00	Brewer Mine†	92	57	76.4	13.99
Siskiyou†	98	45	69.2	0.00	Camden†	96	66	74.2	8.70
Sparta†	98	38	67.6	0.05	Central†	94	57	76.4	14.41
Springbrook†	99	45	68.2	0.03	Cheraw a†	94	57	76.4	14.41
Springfield†	94	49	68.7	0.00	Cheraw b†	94	57	76.4	14.41
The Dalles†	97	47	70.6	0.00	Connors†	90	65	76.4	9.11
Tillamook Rk L.H.†	89	40	62.0	0.40	Cross Hill†	89	65	76.4	9.11
Toledo†	89	40	62.0	0.40	Darlington†	90	69	78.1	15.44
Umatilla†	102	35	68.7	0.00	Davis Bridge†	90	69	78.1	15.44
Vale†	102	35	68.7	0.00	Effingham†	92	58	75.4	6.36
Vernonia†	98	42	62.1	0.19	Evergreen†	92	58	75.4	6.36
West Fork†	102	44	67.8	0.00	Flint Hill†	94	65	79.8	14.17
Weston†	99	43	68.2	0.00	Florence†	89	66	78.4	18.45
Williams†	96	38	65.6	0.00	Georgetown†	89	66	78.4	18.45
Pennsylvania.					Greenville†	89	66	78.4	18.45
Altoona†	93	51	73.4	2.92	Greenwood†	96	64	78.2	5.48
Aqueduct†	97	47	73.2	3.78	Hampton†	92	65	77.9	14.50
Beaver Dam†	94	52	67.2	4.98	Hardeeville†	90	67	78.6	24.67
Blooming Grove†	94	52	67.2	5.75	Kingstree†	97	64	81.3	11.26
Bloomsville†	97	49	71.8	3.07	Kitchings Mills†	95	60	78.6	14.55
Blue Knob†	88	51	68.6	3.58	Longshore†	94	61	77.3	11.99
Brookville†	97	49	71.8	3.07	McCormick†	90	67	76.7	6.38
Brownsville†	97	49	71.8	3.07	Manning†	89	67	76.7	6.38
Brownsville Lock†	95	48	70.8	5.82	Martins†	90	67	76.7	6.38
Carlisle†	95	48	70.8	5.82	Mount Carmel†	90	67	76.7	6.38
Chambersburg†	95	48	70.8	5.82	Nichols†	90	67	76.7	6.38
Clarion†	95	48	70.8	5.82	Pinopolis†	86	70	76.7	18.88
Coatesville†	94	48	72.0	4.68	Port Royal†	90	69	79.6	13.71
Confluence†	94	48	72.0	4.68	Saint Georges†	90	64	78.1	20.45
Coopersburg†	90	53	71.5	6.22	Saint Matthews†	94	66	78.4	12.48
Davis Island Dam†	90	53	71.5	6.22	Saint Stephens†	89	68	76.8	24.24
Dorlstown†	92	42	67.4	6.65	Santuck†	89	68	76.8	24.24
Drifton†	92	42	67.4	6.65	Sedalia†	90	68	75.9	11.48
Du Bois†	93	35	66.1	4.45	Selma†	94	63	77.0	6.23
Dyberry†	93	35	66.1	4.45	Simpsonville†	88	64	76.4	10.20
East Manch Chunk†	95	40	70.4	4.45	Spartanburg†	93	61	77.2	10.77
Easton†	93	50	72.8	5.29	Statesburg†	87	65	75.2	14.29
Edinboro†	86	44	66.6	73.9	Tillers Ferry†	90	53	78.7	12.61
Flks of Neshaminy†	93	40	69.2	4.11	Trenton†	90	69	80.8	13.20
Frederick†	90	49	69.2	4.11	Vance†	92	64	78.4	13.20
Frederick†	90	49	69.2	4.11	Waterloo†	92	64	78.4	13.20
Gettysburg†	90	49	69.2	4.11					
Girardville†	90	49	69.2	4.11					
Grampian†	90	49	69.2	4.11					
Greensburg†	90	49	69.2	4.11					
Hamburg†	98	49	73.5	5.74					

## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
S. Carolina—Cont'd.					Texas—Cont'd.				
Watts * <sup>o</sup>	93	62	77.0	8.64	Camp Eagle Pass	104	59	86.8	1.90
Yorkville	94	60	76.2	9.36	Childress†	100	55	75.0	5.54
Youngs Island††	94	64	78.4	16.85	Coldwater†	99	40	73.2	5.62
South Dakota.					College Station				
Aberdeen†	98	30	68.4	1.84	Colorado b <sup>o</sup> †	107	41	83.9	1.85
Alexandria†	99	35	70.8	2.42	Colorado b <sup>o</sup> †	100	59	85.1	0.00
Ashcroft†	104	30	68.0	0.94	Columbia†	97	59	81.4	3.30
Bear Valley *†	97	46	67.9	1.64	Corsicana†	105	53	84.2	0.65
Bowdie *††	97	43	69.7	1.94	Corsicana b†	98	54	79.8	0.80
Britton†	96	34	67.2	1.93	Cuero†	102	62	85.7	1.41
Brookings†	97	28	68.6	1.70	Dallas b††	100	52	80.6	2.63
Castlewood†	98	30	67.2	2.02	Devine	96	57	81.8	1.25
Cross†	94	30	63.4	0.49	Durham†	107	62	85.5	1.19
De Smet†	103	30	73.0	1.20	Duval *†	107	62	85.5	1.19
Faulkton†	99	33	69.3	0.59	Eagle Pass†	95	64	81.4	1.35
Flandreau†	97	36	67.9	2.15	Eastland *††	95	64	81.4	4.45
Forestburg†	100	32	69.3	1.59	Fay	94	65	82.8	3.23
Fort Meade	101	39	71.4	0.70	Flower Bluff†	94	65	82.8	0.00
Fort Sully	102	40	74.7	0.55	Forestburg†	96	54	79.2	3.63
Frankfort†	100	31	68.9	1.13	Fort Brown†	98	65	84.2	0.18
Gary†	98	38	71.2	1.05	Fort Clark	102	63	84.6	0.36
Greenwood††	98	39	72.2	0.56	Fort Hancock	101	50	76.5	4.83
Hitchcock	98	39	72.2	0.56	Fort McIntosh	100	63	86.3	2.00
Hotch City†	100	34	71.5	0.68	Fort Ringgold†	104	58	85.5	2.10
Howard†	98	33	69.0	0.82	Fredericksburg††	98	57	81.7	1.52
Kimbball†	99	38	71.0	0.57	Gainesville†	98	59	79.6	2.72
Mellette <sup>o</sup> †	98	48	71.6	2.56	Graham†	104	49	82.6	1.68
Midland†	104	36	73.0	0.88	Grape Vine††	106	50	83.3	1.48
Oelrichs†	104	36	70.7	0.75	Hale City††	102	49	75.6	0.39
Onida†	104	30	71.6	0.92	Hallettsville†	102	54	79.7	1.15
Parker†	97	42	70.9	2.23	Hartley†	96	53	74.3	2.86
Parkston†	97	36	69.2	0.84	Haskell†	109	66	87.4	2.00
Piedmont	97	36	69.2	0.84	Hearne†	100	56	81.2	1.60
Plankinton††	95	37	69.5	1.12	Highland	110	51	83.4	3.45
Rosebud†	99	33	68.8	0.95	Houston†	97	62	80.5	3.07
Sioux Falls†	97	34	68.9	2.48	Houstonville†	100	58	81.8	4.40
Spearfish††	102	41	70.6	1.97	Kent	100	58	81.8	2.76
Tyndall†	99	44	72.8	2.05	Laredo†	102	57	87.4	6.41
Watertown†	102	35	70.6	2.63	Llano *††	100	57	82.0	1.05
Webster†	102	35	70.6	3.87	Longview†	100	57	82.0	3.81
Wentworth††	98	34	64.4	0.45	Luling†	98	58	82.8	0.62
Wessington Spgs†	98	40	71.2	1.31	McGregor†	96	54	72.3	1.71
Wolsey *††	98	40	67.3	0.97	Marshall†	98	60	79.0	1.85
Tennessee.					Menardville *††	98	66	81.0	1.07
Andersonville *†	87	54	72.5	1.15	Mesquite††	100	56	80.3	1.20
Arlington†	94	54	76.5	0.35	Mountain Spring†	101	54	80.8	0.78
Ashwood *††	89	58	76.0	5.72	Orange†	96	60	80.6	7.74
Bethel Springs *†	91	66	78.5	0.00	Paris†	98	57	80.3	3.02
Bolivar†	96	52	75.4	0.85	Quana††	103	53	78.6	7.55
Brownsville†	96	50	78.6	0.32	Rio Grande City†	100	57	80.3	2.06
Byrdstown *†	90	60	73.6	3.22	Roby††	109	49	81.6	1.74
Carthage†	98	50	76.5	4.04	Rockport *†	96	66	83.9	0.00
Charleston†	98	50	76.5	1.76	Round Rock†	103	56	85.6	1.23
Clarksville	98	50	76.5	1.05	San Antonio b	102	58	83.0	0.95
Clinton†	98	50	76.5	1.79	San Marcos†	100	56	80.3	0.80
Columbia†	98	50	76.5	3.22	Sherman†	96	53	80.8	2.40
Covington†	93	59	77.4	0.34	Sierra Blanca†	96	50	75.6	5.95
Covington b†	98	54	77.9	0.41	Silver Falls††	99	50	77.4	3.63
Dyersburg†	98	54	78.4	0.07	Stella *†	92	67	81.2	6.00
Florence Station *†	92	65	76.5	2.75	Stough Springs††	110	52	80.2	0.75
Franklin†	94	54	75.8	3.30	Temple†	96	58	80.4	3.07
Greenville *†	86	57	71.2	4.85	Tyler†	98	60	81.2	0.48
Harriman††	92	50	75.5	2.54	Victoria *††	95	73	84.4	1.08
Harrogate†	97	56	72.0	1.63	Waco†	99	56	82.8	4.05
Hohenwald * <sup>o</sup>	96	59	77.2	0.99	Weatherford†	98	56	81.0	1.21
Jacksboro * <sup>o</sup>	87	53	70.5	3.78	Utah.				
Jackson *†	96	60	77.5	1.00	Blue Creek * <sup>o</sup>	100	60	78.4	0.00
Johnson City†	92	50	72.8	5.68	Castle Gate†	94	46	68.5	0.56
Johnsonville†	98	50	76.5	0.87	Cisco†	104	51	76.0	0.67
Kinston†	98	50	76.5	2.16	Corinne * <sup>o</sup>	104	53	78.4	0.00
Lookout Mount††	86	62	74.8	5.86	Deseret†	94	42	69.5	0.91
Loudon†	98	50	76.5	1.55	Dillmore†	102	45	73.0	1.71
Lynnville *†	89	59	74.0	1.82	Fort Du Chesne†	97	44	70.2	0.57
Milan†	96	55	79.0	T.	Green River††	103	50	74.0	0.93
Missionary Ridge * <sup>o</sup>	92	65	74.2	0.00	Grouse Creek *††	96	40	62.6	0.22
Newport * <sup>o</sup>	91	55	73.4	4.85	Heber††	96	33	64.4	0.68
Nunnely *†	92	59	76.4	2.38	Kelton * <sup>o</sup>	106	50	75.6	0.00
Palmetto†	98	50	76.5	2.48	Koosharem	85	39	61.0	2.03
Parksville *†	90	55	74.4	3.48	Lake Park	94	46	71.4	0.37
Piddletown†	90	55	74.4	11.17	Levan†	98	50	68.3	1.08
Rockwood†	98	50	76.5	1.04	Logan†	95	36	69.0	0.11
Rogersville *†	88	62	71.0	4.86	Loosee††	89	38	66.0	4.50
Ruby†	88	60	68.4	3.24	Moab††	95	50	71.8	1.11
Savannah *†	91	54	78.9	1.04	Ogden * <sup>o</sup>	100	65	79.4	T.
Springdale *†	91	50	74.8	4.00	Ogden b *††	95	60	77.6	0.78
Strawberry Plains†	98	50	76.5	2.90	Parowan†	99	47	70.4	1.65
Tazewell†	98	50	76.5	3.94	Promontory * <sup>o</sup>	105	52	73.2	0.05
Trenton†	94	54	76.9	T.	Provo City††	98	50	70.0	0.56
Ullahoma *†	90	60	79.1	3.25	Richdolph††	96	38	62.4	0.09
Waynesboro *†	92	53	73.8	1.30	Richfield††	96	42	66.8	1.02
Vier††	89	54	74.8	8.00	Saint George††	112	56	82.8	0.61
Texas.					Scio††	85	25	55.9	2.12
Abilene *††	97	55	81.3	1.39	Singletree *††	88	40	58.8	3.66
Arlington†	99	54	81.7	2.83	Snoville††	98	36	67.6	0.11
Arthur City†	103	58	82.8	0.98	Soldiers Summit†	74	26	51.3	0.22
Aurora *†	101	71	84.8	2.10	Terrace†	98	60	77.1	0.00
Austin†	98	63	84.0	0.00	Thistle††	110	40	65.8	2.40
Austin b * <sup>o</sup>	98	42	75.4	3.05	Vermont.				
Berne *†	97	59	79.5	1.05	Brattleboro a	91	47	68.6	6.13
Bradley†	99	50	81.9	0.61	Burlington†	88	52	70.2	8.31
Brasoria†	95	64	79.0	4.74	Cornwall	90	40	65.0	7.06
Brownham†	100	50	83.6	1.61	Enosburg Falls†	89	36	65.8	6.21
Brownwood†	103	58	83.2	2.77	Hardland†	87	37	63.9	5.65
Burnet *††	94	64	83.6	0.70	Hyde Park†	95	34	66.3	5.48
					Jacksonburg†	90	44	64.9	2.59
					Johnsonville	92	34	64.2	9.11

## Meteorological record of voluntary observers, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Vermont—Cont'd.</i>	0	0	0	<i>Ins.</i>	<i>W. Virginia—Cont'd.</i>	0	0	0	<i>Ins.</i>
Norwich <sup>1</sup> .....	88	45	60.6	4.30	New Martinsville <sup>1</sup> .....	98	54	71.2	3.49
Simonsville.....	84	36	61.7	.....	Nuttallburg <sup>1</sup> .....	93	53	71.4	3.12
South Royalton <sup>1</sup> .....	92	44	66.2	6.30	Parkersburg <sup>1</sup> .....	93	51	71.4	3.12
Stratford <sup>1</sup> .....	86	48	65.2	5.78	Phillippi <sup>1</sup> .....	91	60	69.1	4.27
Vernon <sup>1</sup> .....	94	50	66.0	7.86	Pleasant Hill <sup>1</sup> .....	94	54	72.7	3.53
Wells.....	90	47	66.2	9.18	Rowlesburg <sup>1</sup> .....	93	52	72.3	2.06
Woodstock.....	91	38	65.7	5.39	Spencer <sup>1</sup> .....	95	44	71.2	2.01
<i>Virginia.</i>					Tannery <sup>1</sup> .....	94	52	72.3	2.06
Abingdon <sup>1</sup> .....	95	53	74.4	1.90	Weston <sup>1</sup> .....	90	39	72.4	.....
Ashland <sup>1</sup> .....	92	55	75.1	3.00	Wheeling <sup>1</sup> .....	92	54	73.2	4.51
Bedford City <sup>1</sup> .....	90	57	73.4	7.12	White Sulphur Springs <sup>1</sup> .....	93	51	72.7	2.00
Big Stone Gap <sup>1</sup> .....	89	47	66.7	3.32	<i>Wisconsin.</i>				
Birdsneat <sup>1</sup> .....	92	64	76.4	4.05	Amherst.....	94	38	67.2	1.16
Blacksburg <sup>1</sup> .....	91	52	67.6	3.29	Ashland <sup>1</sup> .....	93	31	63.0	4.87
Buchanan <sup>1</sup> .....	90	59	74.8	.....	Baraboo <sup>1</sup> .....	97	41	67.3	1.25
Cape Charles <sup>1</sup> .....	90	59	74.8	.....	Barron <sup>1</sup> .....	97	38	64.0	3.60
Christiansburg <sup>1</sup> .....	90	59	74.8	.....	Bayfield.....	98	54	71.5	1.60
Clarksville <sup>1</sup> .....	90	59	74.8	.....	Belleville.....	96	36	66.4	3.11
Columbia <sup>1</sup> .....	90	59	74.8	.....	Beloit <sup>1</sup> .....	95	42	69.5	1.41
Dale Enterprise <sup>1</sup> .....	93	50	70.4	.....	Black River Falls <sup>1</sup> .....	97	38	66.8	1.28
Danville <sup>1</sup> .....	90	59	74.8	.....	Butternut <sup>1</sup> .....	98	42	64.8	6.41
Emporia <sup>1</sup> .....	98	70	83.3	.....	Centralia.....	93	37	67.6	1.25
Falls Church <sup>1</sup> .....	90	59	74.8	.....	Chippewa Falls <sup>1</sup> .....	96	37	66.0	2.60
Fredericksburg <sup>1</sup> .....	95	51	74.8	.....	Crandon <sup>1</sup> .....	92	31	63.2	2.36
Hampton.....	93	62	77.7	.....	Delavan (near) <sup>1</sup> .....	96	50	73.5	1.43
Hot Springs.....	87	44	67.8	.....	Depere <sup>1</sup> .....	92	41	66.5	1.30
Irwin <sup>1</sup> .....	90	55	74.0	.....	Eau Claire.....	92	37	66.7	1.77
Lexington <sup>1</sup> .....	92	47	71.0	.....	Estella <sup>1</sup> .....	95	31	68.6	5.39
Marion <sup>1</sup> .....	89	47	70.2	.....	Florence <sup>1</sup> .....	93	30	62.8	1.94
Nottoway.....	97	31	75.4	.....	Fond du Lac <sup>1</sup> .....	94	40	66.0	2.04
Petersburg <sup>1</sup> .....	93	54	75.2	.....	Grantsburg <sup>1</sup> .....	95	33	64.5	2.93
Richmond a <sup>1</sup> .....	97	53	75.8	.....	Hammond <sup>1</sup> .....	97	39	67.8	1.81
Richmond b <sup>1</sup> .....	97	53	75.8	.....	Harvey <sup>1</sup> .....	92	42	67.8	1.70
Riverton <sup>1</sup> .....	97	53	75.8	.....	Hayward <sup>1</sup> .....	89	31	63.0	4.12
Saluda <sup>1</sup> .....	93	55	75.7	.....	Hillsboro.....	90	35	65.2	3.13
Spottsville <sup>1</sup> .....	92	52	75.7	.....	Janesville.....	92	40	67.2	.....
Standardsville <sup>1</sup> .....	93	55	74.0	.....	Juneau <sup>1</sup> .....	96	42	68.1	1.84
Stephens City <sup>1</sup> .....	90	50	75.6	.....	Koepnick <sup>1</sup> .....	90	46	64.8	2.40
Waraw <sup>1</sup> .....	94	56	75.6	.....	Lancaster <sup>1</sup> .....	94	42	68.4	0.90
Woodstock <sup>1</sup> .....	94	56	75.6	.....	Lincoln <sup>1</sup> .....	90	50	67.6	1.13
Wytheville <sup>1</sup> .....	88	46	66.3	7.05	Madison <sup>1</sup> .....	90	50	67.6	1.13
<i>Washington.</i>					Manitowish <sup>1</sup> .....	90	45	65.2	2.68
Aberdeen <sup>1</sup> .....	93	46	63.6	1.16	Meadow Valley <sup>1</sup> .....	93	34	66.2	3.63
Anacortes.....	93	46	63.6	1.16	Medford <sup>1</sup> .....	94	31	65.2	1.57
Blaine <sup>1</sup> .....	84	40	60.0	0.12	Medford b <sup>1</sup> .....	94	31	65.2	1.57
Bridgeport <sup>1</sup> .....	102	46	74.4	0.00	Menomonie <sup>1</sup> .....	98	33	64.5	2.33
Chehalis <sup>1</sup> .....	94	41	63.5	0.33	Neillsville <sup>1</sup> .....	92	34	64.6	3.85
Chelan <sup>1</sup> .....	95	50	73.6	.....	New Holstein <sup>1</sup> .....	95	41	64.4	1.40
Colfax <sup>1</sup> .....	94	35	63.6	.....	Oconomowoc <sup>1</sup> .....	93	39	69.6	1.28
Crystal Springs <sup>1</sup> .....	85	53	64.4	.....	Oconto <sup>1</sup> .....	94	39	65.6	1.41
Davenport <sup>1</sup> .....	95	41	67.4	.....	Oscola <sup>1</sup> .....	104	32	68.0	2.18
East Sound <sup>1</sup> .....	70	47	60.2	0.17	Pepin <sup>1</sup> .....	98	35	68.5	1.65
Elbe.....	97	36	65.0	0.86	Portage <sup>1</sup> .....	97	38	69.9	2.61
Ellensburg <sup>1</sup> .....	97	36	65.0	0.86	Prairie du Chien.....	97	38	69.9	2.61
Ferry <sup>1</sup> .....	93	39	62.5	0.22	Raymond.....	96	39	66.8	1.21
Fort Simcoe.....	94	40	70.6	0.00	Reedsburg <sup>1</sup> .....	92	39	66.0	1.43
Fort Spokane.....	103	38	68.0	0.01	Sharon <sup>1</sup> .....	96	40	67.0	1.20
Fort Townsend <sup>1</sup> .....	85	45	59.3	0.16	Shawano.....	93	37	64.8	0.81
Madrone <sup>1</sup> .....	86	44	60.5	0.47	Sparta b <sup>1</sup> .....	91	37	66.0	6.00
Moxee Valley <sup>1</sup> .....	86	44	60.5	0.47	Stevens Point <sup>1</sup> .....	92	35	66.2	1.16
Olga <sup>1</sup> .....	79	45	58.4	0.21	Valley Junction <sup>1</sup> .....	89	32	63.9	3.89
Pomeroy <sup>1</sup> .....	98	53	74.0	0.00	Viroqua.....	99	38	66.2	2.59
Pullman <sup>1</sup> .....	95	38	67.1	0.00	Watertown <sup>1</sup> .....	93	42	66.7	1.55
Rosalia <sup>1</sup> .....	94	33	63.3	.....	Waukesha <sup>1</sup> .....	97	42	66.5	1.32
Silver Creek <sup>1</sup> .....	98	42	63.7	0.34	Westfield <sup>1</sup> .....	91	42	66.5	1.41
Tacoma <sup>1</sup> .....	90	41	63.2	0.40	Weston <sup>1</sup> .....	99	32	65.2	1.82
Union City <sup>1</sup> .....	90	45	63.0	0.40	<i>Wyoming.</i>				
Waterville <sup>1</sup> .....	97	40	67.4	0.40	Camp Pilot Butte.....	95	35	66.8	0.79
West Ferndale.....	94	37	60.8	.....	Fort McKinney.....	97	43	68.7	1.08
<i>West Virginia.</i>					Fort Washakie.....	93	34	64.8	1.05
Bluefield <sup>1</sup> .....	90	49	68.8	6.82	Fort Yellowstone <sup>1</sup> .....	91	.....	.....	1.00
Buckhannon a <sup>1</sup> .....	88	47	68.7	2.87	Lander.....	90	41	66.2	1.12
Buckhannon b <sup>1</sup> .....	88	47	68.7	2.87	Laramie <sup>1</sup> .....	95	38	60.7	1.08
Central Station <sup>1</sup> .....	88	54	74.4	4.90	Lusk <sup>1</sup> .....	97	36	67.7	1.07
Charleston a <sup>1</sup> .....	85	41	63.6	4.33	Saratoga <sup>1</sup> .....	86	31	60.8	2.24
Davis <sup>1</sup> .....	85	41	63.6	1.49	Sheridan.....	99	33	65.4	0.12
Elkhorn <sup>1</sup> .....	90	49	70.3	4.04	Sundance.....	94	33	66.2	0.97
Ella <sup>1</sup> .....	90	47	70.3	3.71	Wheatland <sup>1</sup> .....	102	49	69.6	0.27
Fairmont <sup>1</sup> .....	90	47	70.3	3.71	<i>Mexico.</i>				
Glenville <sup>1</sup> .....	91	53	70.0	3.79	Leon de Aldamas <sup>1</sup> .....	83	53	68.0	3.88
Grafton <sup>1</sup> .....	95	48	70.2	1.76	Pueblo <sup>1</sup> .....	78	52	64.9	14.25
Harpers Ferry <sup>1</sup> .....	95	48	70.2	1.76	Vera Cruz.....	90	74	82.3	10.10
Hinton <sup>1</sup> .....	95	48	70.2	1.76	<i>New Brunswick.</i>				
Huntington <sup>1</sup> .....	95	48	70.2	1.76	Saint John.....	84	52	63.4	6.91
Kingwood <sup>1</sup> .....	93	46	66.0	3.00	<i>Canada.</i>				
Martinsburg <sup>1</sup> .....	93	50	72.2	3.50	Barstow <sup>1</sup> .....	104	45	78.6	1.10
Morgantown a <sup>1</sup> .....	93	50	72.2	3.50	Cloverdale <sup>1</sup> .....	105	54	79.5	.....
Morgantown b <sup>1</sup> .....	103	49	72.5	1.34	Edmonton <sup>1</sup> .....	90	39	62.0	.....
New Cumberland.....	97	49	72.0	4.08	Riverside a <sup>1</sup> .....	102	45	74.8	0.00

## Received too late for publication in July, 1893.

<i>Alabama.</i>					<i>California.</i>				
Geneva <sup>1</sup> .....	102	71	84.6	5.67	Barstow <sup>1</sup> .....	104	45	78.6	1.10
<i>Alaska.</i>					Cloverdale <sup>1</sup> .....	105	54	79.5	.....
Coal Harbor <sup>1</sup> .....	72	39	51.7	.....	Edmonton <sup>1</sup> .....	90	39	62.0	.....
<i>Arizona.</i>					Riverside a <sup>1</sup> .....	102	45	74.8	0.00
Ariz. Canal Co. Dam.....	111	75	93.2	1.22	<i>Colorado.</i>				
Fort Mohave.....	114	60	92.8	0.17	Greeley <sup>1</sup> .....	96	49	74.2	0.07
Wood Canyon.....	.....	.....	.....	6.00	Kirk <sup>1</sup> .....	.....	.....	.....	1.80
<i>Arkansas.</i>					Manhattan <sup>1</sup> .....	43	62.4	1.52	.....
Wigga.....	.....	.....	.....	2.93	Saint Cloud.....	.....	.....	.....	0.15

## Reports received too late, &amp;c.—Continued.

Stations.	Temperature. (Fahrenheit.)			Precip'n.	Stations.	Temperature. (Fahrenheit.)			Precip'n.
	Max.	Min.	Mean			Max.	Min.	Mean	
<i>Florida.</i>	0	0	0	<i>Ins.</i>	<i>Nebraska.</i>	0	0	0	<i>Ins.</i>
Saint Petersburg <sup>1</sup> .....	96	72	83.2	3.41	Kennedy <sup>1</sup> .....	99	60	73.7	1.80
<i>Idaho.</i>					Kimball <sup>1</sup> .....	103	47	74.3	0.99
American Falls <sup>1</sup> .....	102	33	68.0	.....	<i>New York.</i>				
Oakley <sup>1</sup> .....	108	50	76.0	0.00	Hess Road Station <sup>1</sup> .....	90	50	70.3	2.74
<i>Illinois.</i>					<i>Ohio.</i>				
Peoria a <sup>1</sup> .....	.....	.....	.....	2.60	Plattsburg <sup>1</sup> .....	.....	.....	.....	2.56
<i>Iowa.</i>					<i>Pennsylvania.</i>				
Council Bluffs.....	100	55	78.0	4.56	Beaver Dam <sup>1</sup> .....	.....	.....	.....	2.47
Osage <sup>1</sup> .....	99	61	71.3	4.08	<i>South Carolina.</i>				
<i>Kansas.</i>					Flint Hill <sup>1</sup> .....	102	62	82.9	2.81
Elk City <sup>1</sup> .....	99	62	79.8	4.02	<i>Tennessee.</i>				
Ellis <sup>1</sup> .....	100	50	78.8	.....	Dyersburg <sup>1</sup> .....	100	62	80.8	2.17
Englewood <sup>1</sup> .....	110	58	83.4	0.60	<i>Texas.</i>				
Gibson <sup>1</sup> .....	100	54	74.8	4.90	Panther <sup>1</sup> .....	112	70	89.4	2.33
Hays City <sup>1</sup> .....	104	42	74.1	2.79	<i>Utah.</i>				
Leoti <sup>1</sup> .....	104	53	76.8	3.61	Blue Creek <sup>1</sup> .....	110	65	87.0	0.10
<i>Maine.</i>					<i>West Virginia.</i>				
Mayfield.....	88	41	65.9	3.27	Morgantown b <sup>1</sup> .....	99	50	74.5	1.66
<i>Massachusetts.</i>					<i>Canada.</i>				
Taunton <sup>1</sup> .....	94	47	70.2	1.96	Fort Francis, Ont. <sup>1</sup> .....	88	39	64.4	5.09
Wellesley.....	.....	.....	.....	1.97	<i>Mexico.</i>				
<i>Montana.</i>					Mazatlan.....	89	73	82.6	6.65
Glasgow.....	110	38	71.4	.....	Mexico <sup>1</sup> .....	79	52	60.8	3.58
Virginia City <sup>1</sup> .....	97	40	67.8	0.74	Vera Cruz.....	88	70	78.2	23.06

\*Extremes of temperature from observed readings of dry thermometer.

†Weather Bureau instruments.



## Climatological data for August, 1893—Weather Bureau Stations.

Districts and stations.	Elevation above sea-level, feet.	Length of record, years.	Pressure, in inches.		Temperature of the air, in degrees Fahrenheit.					Humidity and precipitation.					Wind.			Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Mean temperature data since opening of station.										
			Mean pressure, 8 a. m. and 8 p. m. + 2.	Mean reduced.	Mean max. and min. + 2.	Departure from normal.	Maximum.	Date.	Minimum.	Mean minimum.	Greatest daily range.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.	Departure from normal.	Days with -0.1 or more.	Total movement, miles.					Prevailing direction.	Maximum velocity.	Direction.	Date.	Year.	Lowest for month.	Year.				
New England.																																
Eastport.....	53	21	29.86	29.92	67.8	+0.7	62.1	+1.5	90	10	70	51	1	54	34	55	83	4.94	+0.6	14	5,306	sw.	46	ne.	21	7	13	6.3	1893	59.1	1879	
Portland.....	103	22	29.83	29.93	66.8	+1.8	60.8	+1.5	90	25	74	55	14	59	27	58	78	2.74	+1.0	13	5,646	nw.	40	se.	29	9	12	5.2	1870	64.1	1885	
Manchester.....	247	7	29.70	29.90	68.4	+0.6	65.4	+0.6	95	10	75	48	3	58	35	58	75	3.99	+0.4	13	3,737	nw.	31	se.	29	14	7	4.6	1888	65.3	1887	
Northfield.....	872	7	29.06	29.97	64.0	+1.9	61.0	+1.9	91	10	75	36	14	54	38	58	83	6.14	+1.9	17	5,514	s.	33	w.	29	10	11	5.7	1887	61.0	1887	
Boston.....	125	23	29.84	29.98	69.6	+1.1	65.6	+1.1	93	25	77	53	14	63	25	59	75	6.40	+2.0	13	7,585	nw.	48	s.	29	9	14	5.7	1887	61.1	1887	
Nantucket.....	14	10	29.97	29.98	68.2	+0.8	65.2	+0.8	81	12	74	60	31	63	17	60	76	4.40	+0.1	7	6,941	sw.	52	ne.	21	10	10	5.2	1881	67.4	1889	
Woods Holl.....	16	10	29.97	29.98	68.6	+0.1	65.6	+0.1	82	9	74	57	14	64	22	.....	.....	6.27	+2.1	8	9,450	sw.	60	n.	21	12	7	5.6	1877	66.2	1874	
Vineyard Haven.....	7	13	29.95	29.98	70.1	+0.9	65.1	+0.9	85	12	77	55	31	63	22	.....	.....	6.43	+2.2	10	9,470	sw.	72	ne.	21	16	8	7.3	1892	70.0	1889	
Block Island.....	27	13	29.95	29.98	67.6	+0.5	64.6	+0.5	79	12	73	56	14	63	19	63	89	5.41	+1.1	8	9,470	sw.	72	ne.	21	16	8	7.3	1892	67.2	1885	
Narragansett Pier.....	12	12	29.84	29.95	70.6	+2.1	65.6	+2.1	83	15	70	48	14	61	30	.....	.....	4.85	+1.6	8	6,133	s.	57	s.	29	16	7	4.5	1881	67.2	1885	
New Haven.....	107	21	29.84	29.95	72.0	+0.7	67.0	+0.7	85	25	79	52	14	62	29	62	77	4.60	+1.3	10	5,193	nw.	57	se.	29	16	8	4.4	1877	67.3	1883	
New London.....	47	23	29.92	29.96	74.5	+1.0	69.5	+1.0	85	15	77	52	*	62	30	62	81	3.74	+0.1	10	5,193	nw.	57	se.	29	16	8	4.4	1877	67.5	1874	
Mid. Atlantic States.																																
Albany.....	85	20	29.88	29.97	72.0	+1.8	67.0	+1.8	94	10	82	50	14	62	31	61	74	7.21	+3.4	9	5,205	s.	44	se.	29	11	14	6	5.0	1881	66.8	1874
New York, N. Y.....	185	23	29.78	29.97	74.4	+2.6	69.4	+2.6	93	25	82	58	14	66	24	62	74	7.18	+2.4	11	7,115	s.	54	se.	29	11	13	7	4.7	1875	70.6	1874
Harrisburg.....	377	6	29.59	29.98	73.1	+2.1	68.1	+2.1	95	5	83	54	14	63	31	60	68	3.69	+2.4	9	4,580	e.	40	w.	29	13	8	4.7	1892	69.8	1889	
Philadelphia.....	117	23	29.80	29.98	75.6	+2.1	70.6	+2.1	93	9	85	58	14	66	29	61	68	2.43	+2.4	9	7,279	n.	55	ne.	24	10	12	9	5.2	1876	71.3	1874
Atlantic City.....	53	20	29.93	29.98	72.0	+1.2	67.0	+1.2	86	29	77	58	14	66	19	66	84	3.55	+1.2	10	7,825	sw.	52	ne.	23	19	8	4	3.6	1874	69.3	1889
New Brunswick.....	179	23	29.79	29.98	73.4	+1.0	68.4	+1.0	95	12	84	50	14	62	33	.....	.....	9.91	+0.6	12	5,222	se.	42	se.	29	19	6	3.9	1879	72.6	1874	
Baltimore.....	112	23	29.88	29.99	74.6	+1.1	69.6	+1.1	95	25	85	55	14	64	32	61	67	2.32	+2.1	9	4,280	s.	42	se.	29	19	7	5	3.7	1879	71.6	1874
Washington, D. C.....	20	20	29.88	29.99	76.2	+0.2	71.2	+0.2	95	12	83	62	16	70	23	.....	.....	3.77	+2.0	11	5,222	se.	42	se.	29	19	6	3.7	1879	71.6	1874	
Cape Henry.....	685	23	29.28	30.00	74.3	+0.2	69.3	+0.2	93	25	84	53	15	65	29	67	84	8.05	+0.4	14	2,598	e.	30	se.	28	11	12	8	5.3	1881	72.0	1874
Lynchburg.....	57	23	29.93	29.99	76.0	+0.8	71.0	+0.8	91	12	83	62	16	70	26	69	83	5.71	+2.2	13	6,092	ne.	45	se.	28	8	13	5.6	1879	73.3	1874	
Norfolk.....	77.6	+0.7	75.3	+1.2	70.9	+0.3	65.9	+1.4	60.9	+0.3	65.9	+1.4	60.9	+0.3	65.9	+1.4	60.9	+0.3	65.9	+1.4	60.9	+0.3	65.9	+1.4	60.9	+0.3	65.9	+1.4	60.9	+0.3	65.9	+1.4
S. Atlantic States.																																
Charlotte.....	773	15	29.17	29.96	75.3	+1.2	70.3	+1.2	93	25	84	58	15	66	29	66	78	9.81	+4.5	10	4,541	e.	42	se.	28	12	6	13	5.6	1880	73.6	1879
Hatteras.....	11	13	29.96	29.99	70.9	+0.3	65.9	+0.3	85	11	81	64	15	73	14	71	84	7.30	+1.0	13	9,149	ne.	60	n.	23	5	10	10	6.4	1892	75.5	1886
Kittyhawk.....	9	19	29.95	29.97	76.0	+1.4	71.0	+1.4	90	12	81	64	16	71	25	70	82	3.54	+4.3	12	10,595	ne.	70	ne.	23	9	7	15	5.9	1888	74.9	1886
Raleigh.....	388	7	29.58	29.98	76.0	+0.4	71.0	+0.4	93	25	84	61	16	68	27	68	81	7.80	+0.2	10	3,841	n.	28	n.	12	9	8	14	5.9	1887	73.4	1889
Southport.....	34	17	29.93	29.96	76.9	+1.6	71.9	+1.6	87	23	82	62	15	71	19	74	86	5.92	+0.1	20	7,929	sw.	72	s.	28	6	12	13	6.1	1876	76.2	1889
Wilmington.....	78	23	29.90	29.98	77.0	+0.2	72.0	+0.2	89	12	84	62	15	71	23	71	80	8.01	+0.4	18	5,747	sw.	49	se.	28	5	9	17	6.9	1880	76.0	1889
Charleston.....	52	23	29.92	29.97	79.3	+0.5	74.3	+0.5	92	13	85	69	15	73	19	72	84	15.53	+2.9	12	7,295	ne.	96	e.	28	3	16	12	6.8	1878	78.0	1889
Columbia.....	7	7	29.92	29.97	78.2	+0.4	73.2	+0.4	93	17	88	60	28	68	27	.....	.....	8.04	+2.9	12	7,295	ne.	96	e.	28	3	16	12	6.8	1878	78.0	1889
Fort Hill.....	209	22	29.77	29.99	75.7	+1.4	70.7	+1.4	92	8	87	64	24	70	28	70	81	5.13	+3.4	13	4,182	n.	48	nw.	28	12	11	8	5.1	1887	76.5	1889
Augusta.....	98	23	29.80	29.96	79.3	+0.5	74.3	+0.5	92	13	87	67	28	74	24	73	88	12.59	+5.1	21	5,644	ne.	72	ne.	27	4	12	15	5.9	1875	76.7	1875
Savannah.....	43	22	29.91	29.96	81.4	+0.1	76.4	+0.1	95	14	90	69	23	73	23	72	80	10.02	+3.4	19	5,623	s.	48	sw.	27	2	13	10	7.4	1878	78.8	1874
Jacksonville.....	82.2	+0.3	81.2	+0.2	76.2	+0.2	71.2	+0.2	93	8	89	70	*	74	22	76	84	7.38	+2.9	13	6,086	s.	38	w.	20	2	22	7	6.0	1881	79.9	1889
Florida Peninsula.																																
Jupiter.....	28	6	29.93	29.96	81.2	+0.2	76.2	+0.2	93	8	89	70	*	74	22	76	84	7.38	+2.9	13	6,086	s.	38	w.	20	2	22	7	6.0	1881	79.9	1889
Key West.....	22	23	29.90	29.98	83.9	+0.2	78.9	+0.2	91	16	89	71	31	79	15	74	72	1.94	+2.9	13	5,494	se.	35	nw.	20	7	18	6	5.4	1878	81.2	1889
Mico.....	36	7	29.93	29.97	81.9	+0.4	76.9	+0.4	94	*	90	71	*	74	21	75	85	7.52	+0.1	12	4,225	ne.	27	w.	21	6	22	3	5.1	1887	78.7	1889
Tampa.....	36	7	29.93	29.97	81.9	+0.4	76.9	+0.4	94	*	90	71	*	74	21	75	85	7.52	+0.1	12	4,225	ne.	27	w.	21	6	22	3	5.1	1887	78.7	1889
Titusville.....	44	7	29.93	29.97	80.6	+0.4	75.6	+0.4	95	14	88	68	27	73	21	74	81	3.58	+0.1	12	8,431	sw.	55	w.	27	5	23	3	5.3	1881	79.4	1889
Eastern Gulf States.																																
Atlanta.....	1,131	15	28.83	29.99	77.0	+1.2	72.0	+1.2	91	28	86	62																				

[illegible]

\* Two or more directions, dates, or years. † Received too late to be considered in departures, etc. ‡ All temperature and precipitation normals and extremes of temperature are obtained from Fort Keogh records. § All data for 25 days only, except rainfall and total wind movement.



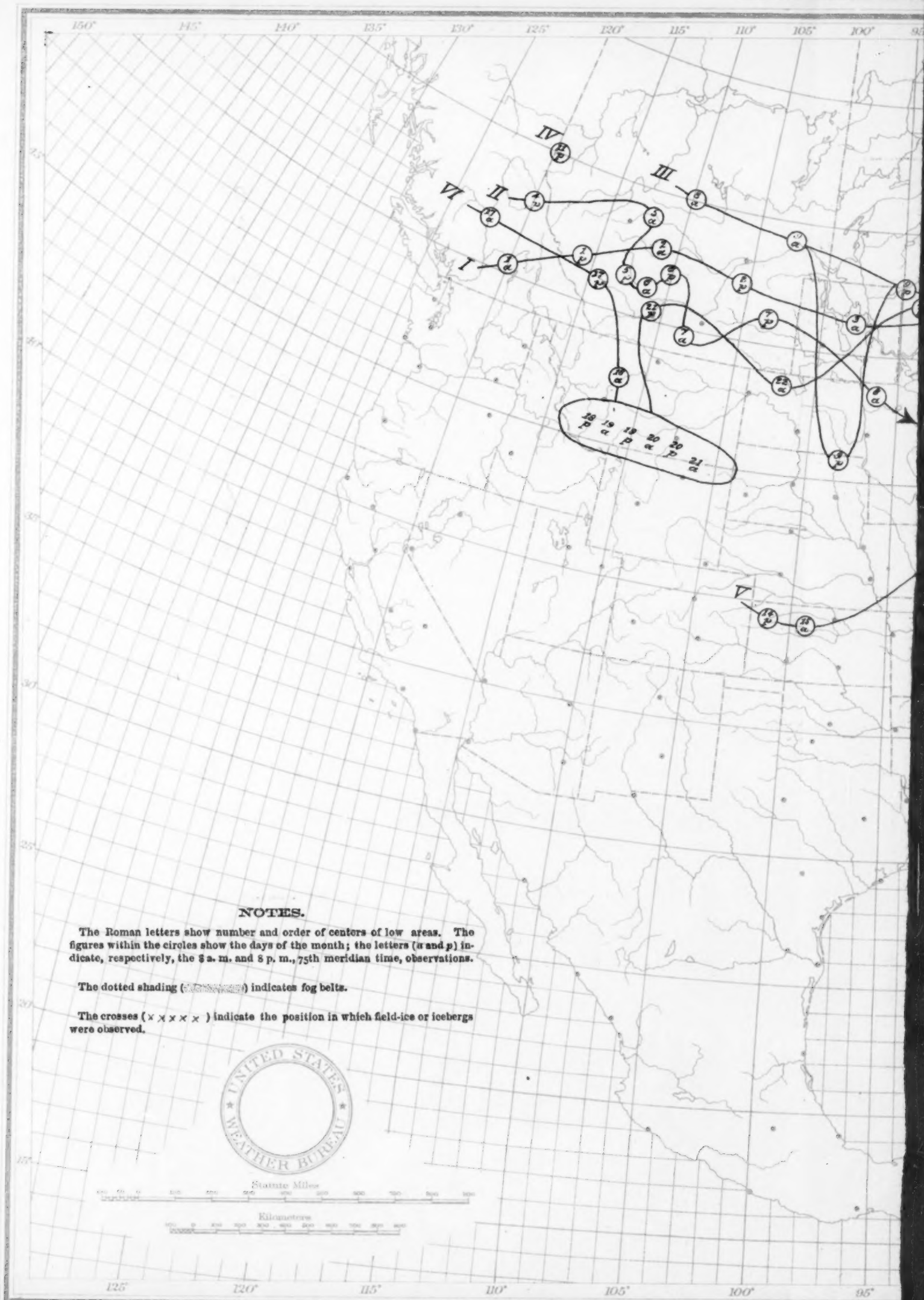
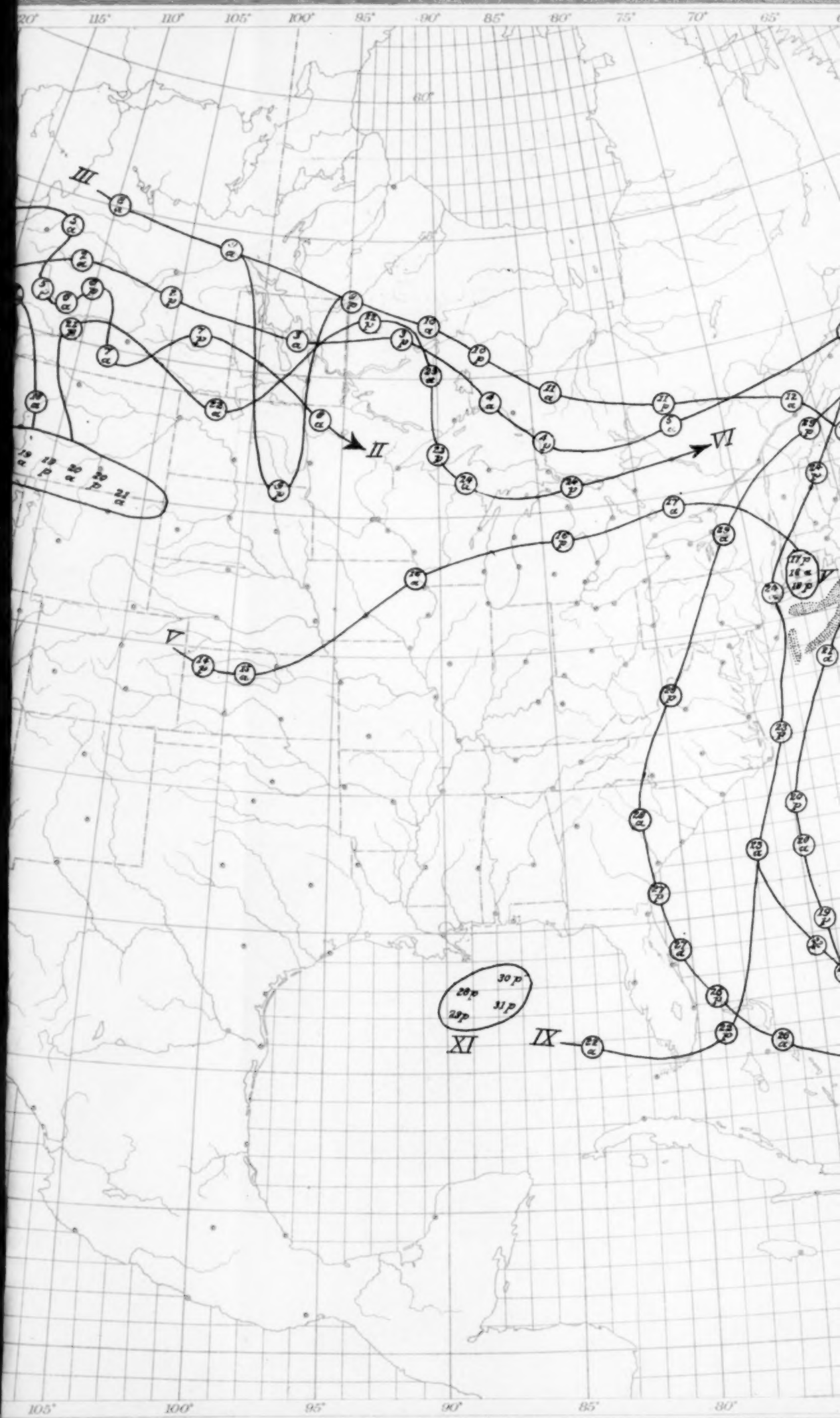


Chart I. Tracks of Centers of Low Areas. August, 1893.







August 1893



THE  
OFFICE OF THE  
NAVY  
WASHINGTON, D. C.  
AUGUST 1893



Chart II. Isobars, Isotherms, and Winds. August, 1893.

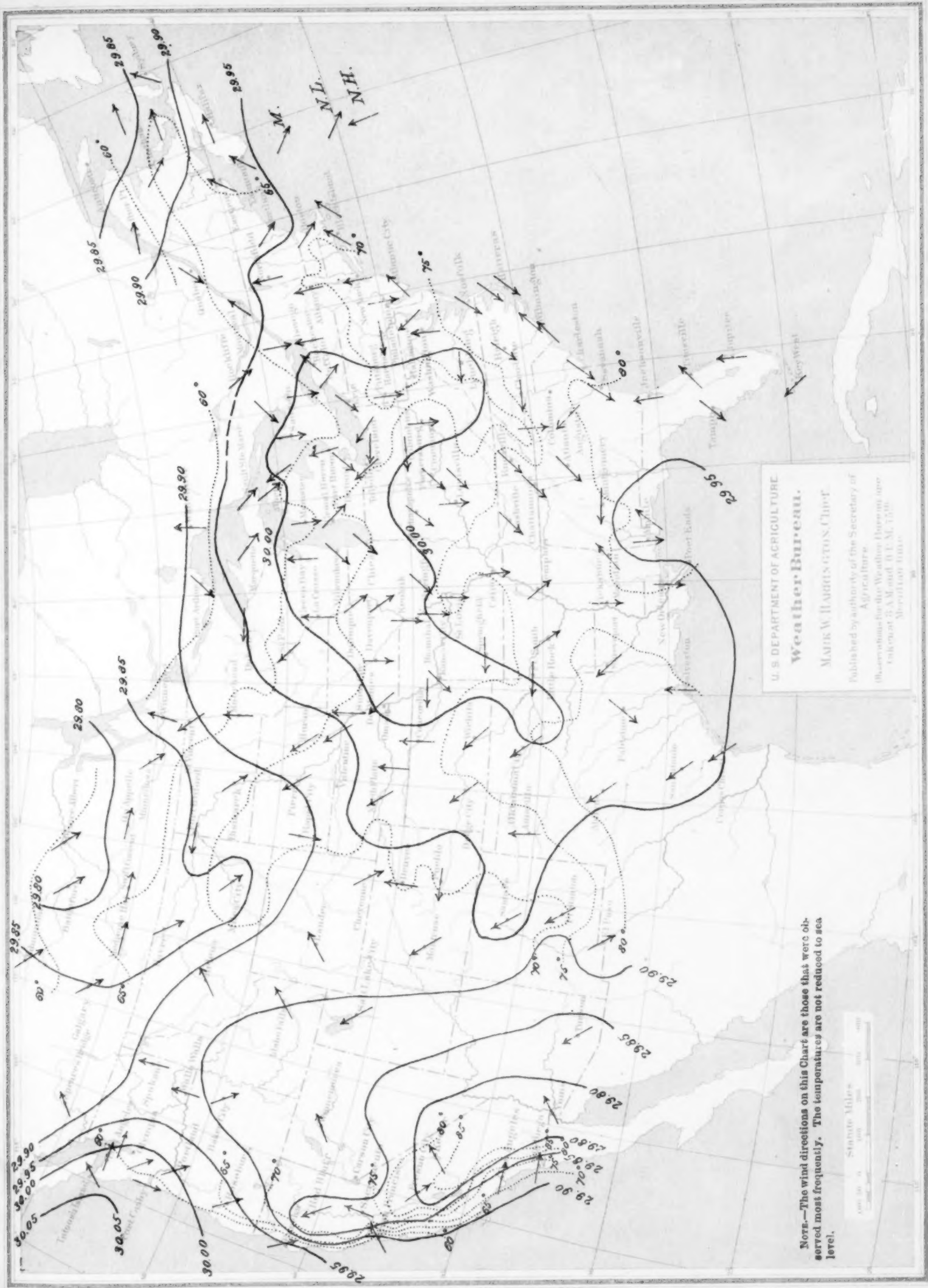


Chart III. Precipitation. August, 1903.



Chart III. Precipitation. August, 1903.



Chart III. Precipitation. August, 1893.

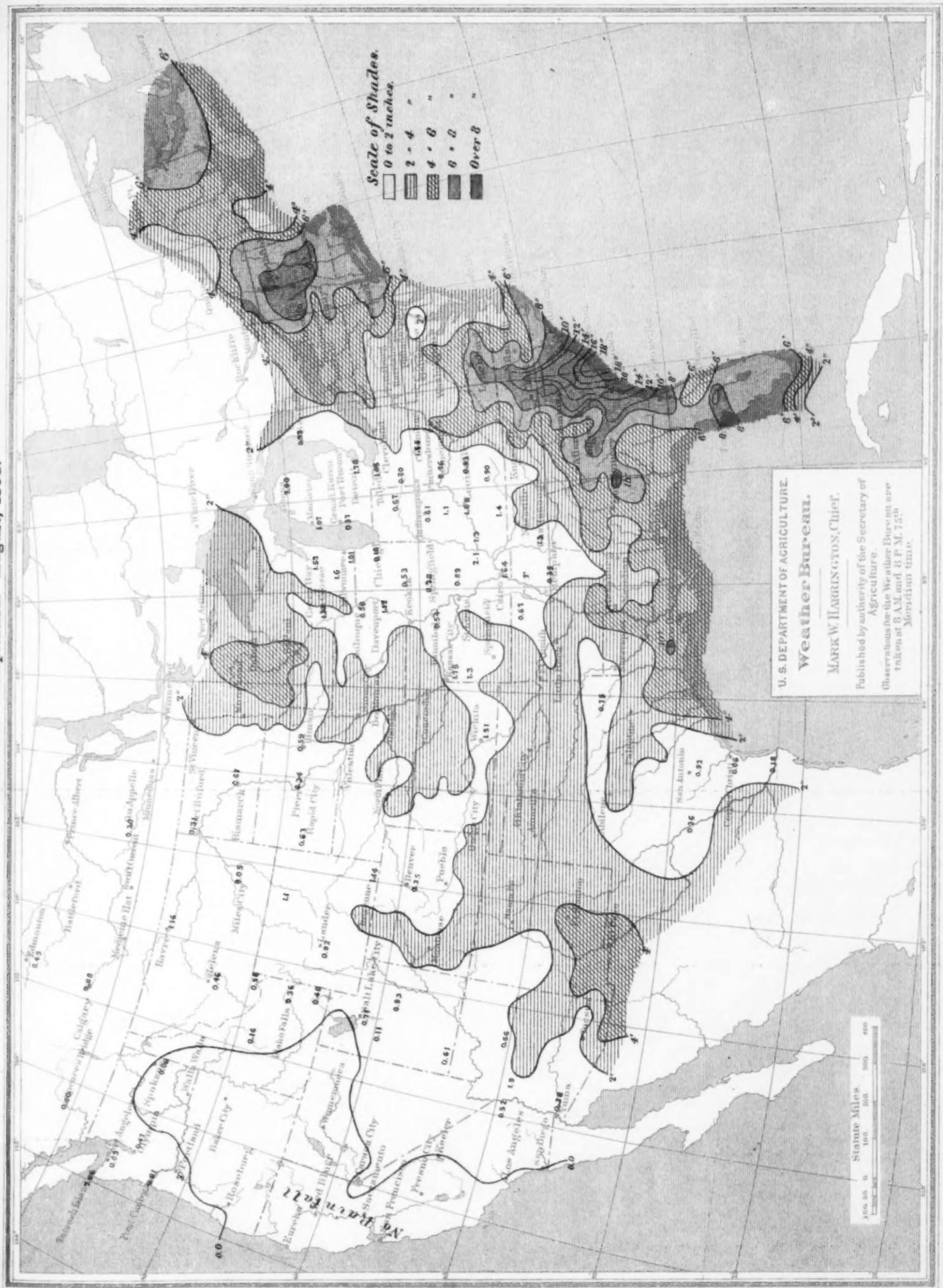
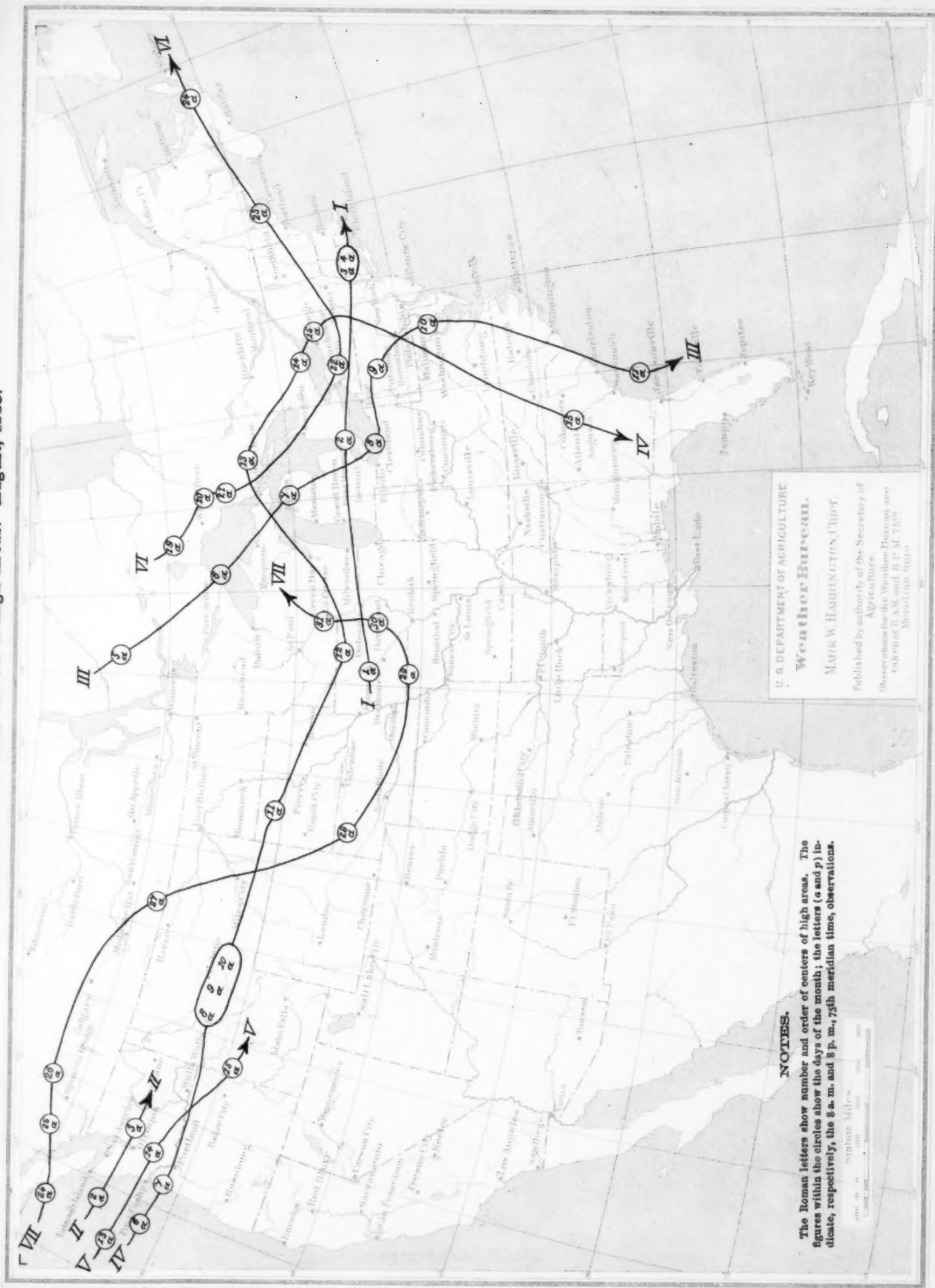






Chart IV. Tracks of Centers of High Areas. August, 1893.



**NOTES.**

The Roman letters show number and order of centers of high areas. The figures within the circles show the days of the month; the letters (a and p) indicate, respectively, the 8 a. m. and 8 p. m., 75th meridian time, observations.

U. S. DEPARTMENT OF AGRICULTURE

**Weather Bureau.**

MARK W. HARRINGTON, Chief.

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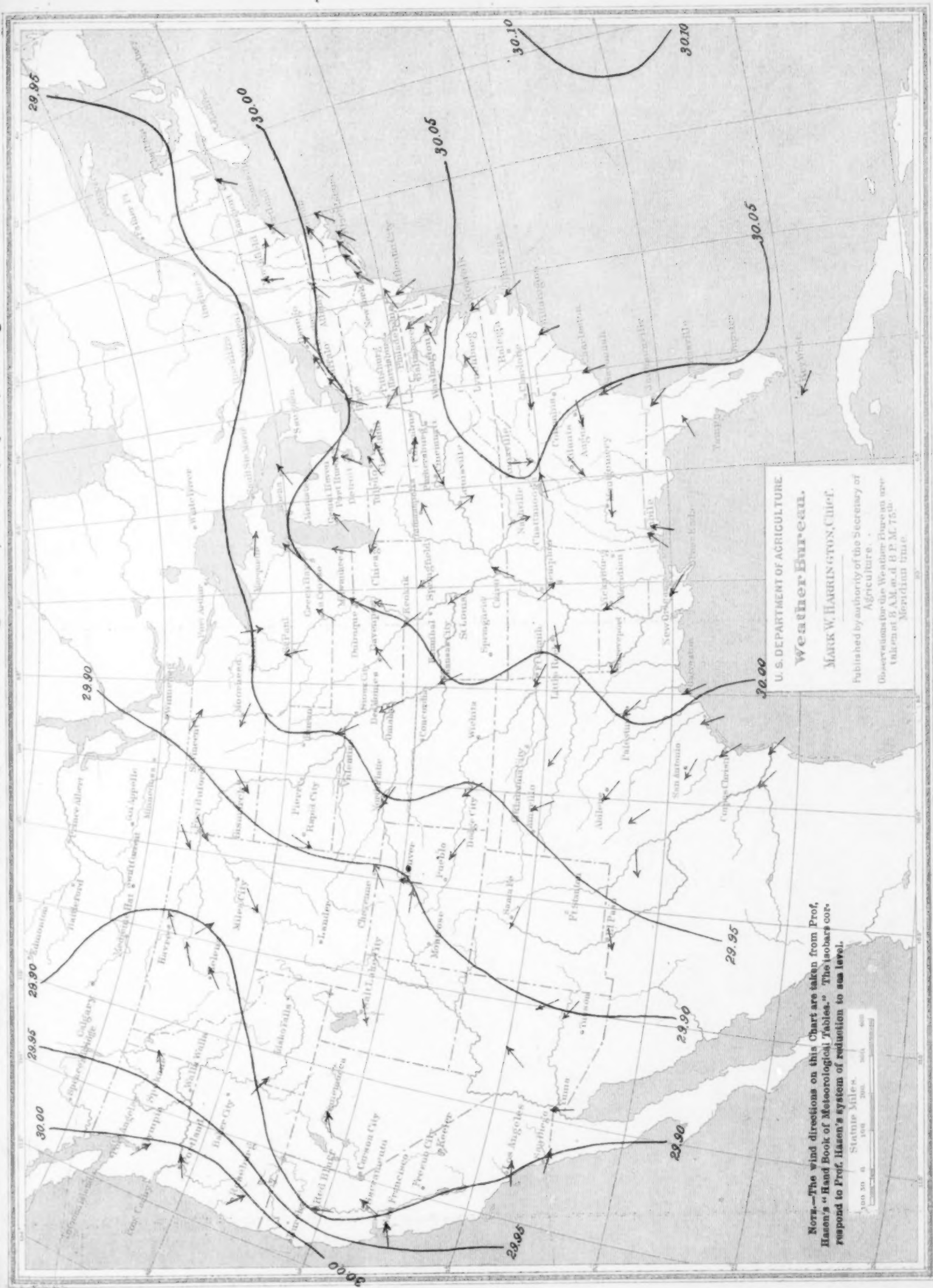
Observations for the Weather Bureau are taken at 8 A. M. and 8 P. M., 75th Meridian time.



Chart V. Normal Pressure (20 years) and Average Wind Direction (15 years) for August.



Chart V. Normal Pressure (20 years) and Average Wind Direction (15 years) for August.



Note.—The wind directions on this Chart are taken from Prof. Hasen's "Hand Book of Meteorological Tables." The isobars correspond to Prof. Hasen's system of reduction to sea level.

Scale 0 to 500 Statute Miles.

U. S. DEPARTMENT OF AGRICULTURE

WEATHER BUREAU.

MARK W. HARRINGTON, CHIEF.

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Observations for the Weather Bureau are taken at 3 A.M. and 3 P.M. 75th Meridian time.